GENERAL LIBRARY UNIV. OF MICH.

GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLV. No. 2906.] LONDON, JANUARY 21, 1919. [71st Year. Price 8d.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C. 2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

ECONOMICAL LIGHT ALUMINIUM LASTING ALUMINIUM EFFICIENT
THE BRITISH ALUMINIUM CO., LTD.,
109, Queen Victoria Street, London.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

"TORBAY PAINT"
(REGISTERED TRADE MARK.)
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

GAS & CANNEL COAL CONTRACTORS.
WM. F. RUSSELL & SONS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

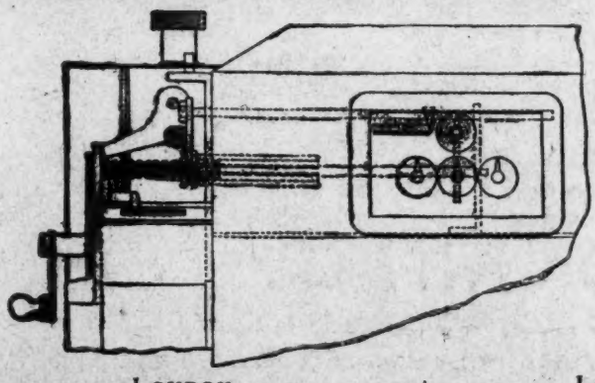
INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia—
JAMES HURLL & CO. LTD., SYDNEY.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 104).

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1946.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

GEORGE GLOVER & CO., LTD.,
CHELSEA.



"THE STANDARD"
SLOT METER.
THE ACME OF SIMPLICITY.
NO SPRING in any part of the mechanism.
Can be fitted with **STRONG BOX,** if desired, or with **"M & M" LOCK.**

LONDON:
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, S.W.3.
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, London."

LEEDS:
9, DEWSBURY ROAD.
TELEPHONE: No. 26463.
WIRE: "Meters, Leeds."

MANCHESTER:
GAYTHORN METER WORKS, EASTON STREET.
TELEPHONE: No. 6398 City.
WIRE: "Slot, Manchester."

RITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.

H. LITTONELL, FOR PATENT SLOT METER PAD & OTHER LOCKS. KENTISH TOWN, N.W. H. & J. DEMPSTER, LTD., BROADWAY, WESTMINSTER, S.W. 1. MANCHESTER.

J. & J. BRADDOCK

(Branch of Meters Limited).

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815. **OLDHAM,**

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, Lamb London." Telephone 2412 Hop. **LONDON, S.E. 1.**

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

ARROL-FOULIS

Stoking Machinery

HYDRAULIC COKE PUSHERS

(HUNTER and BARNETT'S PATENT.)

WILL DISCHARGE A RETORT IN ONE OPERATION

LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

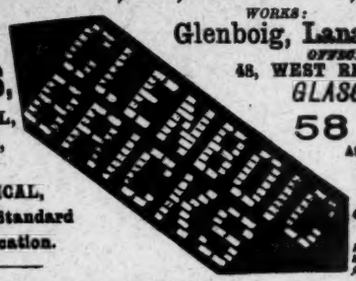
GLASGOW.

LONDON ADDRESS: 56, VICTORIA STREET, S.W.

(See Advertisement, Dec. 24, p. 678.)

THE GLENBOIG UNION FIRE-CLAY Co. Ltd.

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.



WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., GLASGOW.

58 FIRST AWARDS At International and Home Exhibitions, including Grand Prize at Brussels, 1910.

In every case the highest award given for Fire Clay Goods.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

GAS SERVICE REGULATORS.

PATENT No. 5093/08.

THOUSANDS IN USE.

For Gas Stoves.

Fig. 618.
For reducing from 10 ins. to 2 ins. or 3 ins.
(Half Actual Size.)

Fig. 568.
For reducing the ordinary district pressure down to any outlet pressure from 10-10ths to 50-10ths.

The Governors are also suitable for regulating the supply of gas to gas engines.
High Pressure Type supplied for Higher Inlet Pressures up to 50 lbs.

No liquid or mercury seal floats.
Do not require accurate setting.
Constant outlet pressure maintained.
Inlet pressure can vary over wide range.
Regularity of light.

(High Pressure Type also for Higher Inlet Pressure.)

For Street Lamps.

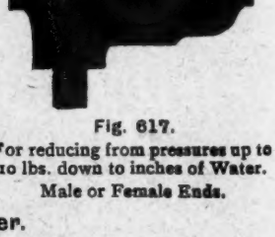


Fig. 617.
For reducing from pressures up to 10 lbs. down to inches of Water.
Male or Female Ends.

When ordering, state Outlet Pressures and Figure Number.

DISTRICT GOVERNORS. ROTARY COMPRESSORS.

Regulators sent on Trial. *Price Lists and Discounts on Application.*

THE BRYAN DONKIN CO., Ltd.,

Head Office and Works, CHESTERFIELD.

London Office: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5368 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin Vic. London."

GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLV., No. 2906.] TUESDAY, JANUARY 21, 1919. [71ST YEAR.

EDITORIAL NOTES.

Organization and Some Reflections.

TEN days more. This is the period left to the gas undertakings desiring to become members of the National Gas Council to take their part in the organization of the first District Executive Boards, and to elect representatives for the Central Executive Board, which will have a powerful influence upon the future policy of the gas industry. Of course, any gas undertaking will be eligible to join at any time; but every gas undertaking intending to do so may as well be in at the start (and bring its share of knowledge and influence to bear upon the initial work and elections) as to come in later. The scope there is for a body representative of the gas undertakings of the United Kingdom requires no emphasis to-day; but the developments of the times will induce fresh reflection. One of the matters to be discussed at the great International Peace Conference is the League of Nations. It is recognized in high political circles that such a League, while not affecting independence of governmental action, will have an important effect upon the maintenance of the peace of the world, and in promoting international concord and welfare, and enterprise generally. There is no want of expanse and depth for the foundations of such a fabric, and for deliberation and action between the nations. It is all consonant with the alliance to defeat the machinations of the enemies of the world. There is logic in the submission that what is good for nations in this respect is good for gas undertakings; not only good, but necessary. We have often shown that the ground for joint and authoritative action in the industry is extensive; and to-day the ground is more extensive, and the joint action more imperative, than they have ever been in the whole history of gas undertakings. This history shows that at every point in the development of the industry, there have been contests with the traditional forces of parliamentary custom and precedent, into which contests the whole weight of the industry has not been brought through the neglect of the undertakings to weld themselves together in a body which could faithfully and influentially represent their interests. The times have given birth to new problems; and we can see in the times a fecundity which will make great claims on the powers of watchfulness and of effective movement, both offensive and defensive. The old methods of disjointed and partial action would be next to useless under the new order of things. Therefore, if there is now failure to secure a strong combination of gas undertakings, we are confident that the industry will rue the day of inaction and neglected opportunity.

Everything is undergoing change. The conditions of war with which the country and the industry have been encompassed are undergoing slow transformation to conditions of peace. But these conditions of peace are not the old ones. In every direction in industry, new productive standards have been set up. We have important instances of this in the gas industry, which instances refuse to be ignored. They are the products of inventiveness and adaptability, or of discovery of dormant resources in waste, and have proved their worthiness, scientifically and economically, to permanent residence in our processes, and not merely a temporary presence as auxiliaries during the pressure of the immediate past years. It is the duty of the gas industry to protect the gains made during the chaos inflicted by wartime conditions. To be granted this protection will be but a relatively poor reward for the service impositions and difficulties of the past few years. To obtain from Parliament the grant of this protection will not be effected by the action of any isolated undertakings. There will have to be united action, and a common case presented, with all the force available to the progressives of the industry brought to bear. The industry will have to approach Parliament; it will have to act on the defensive in Parliament. The Government are giving preferential consideration to an industry which is the competitor of the gas industry—a good ally of the Government during wartime—and this preferential consideration stands on a foundation full of flaws and hollows, but the detection of which is too much for the purely political vision.

What has already been written should be enough to make every gas undertaking in the country anxious to be a member of the National Gas Council, and to take part in the election of both District and Central Executive Boards. There is much else up against which the gas industry stands—to a large extent in common with other industries. Coal and labour are the two most prominent requirements of the gas industry; they are also the two foremost necessaries for the sources of the industry's other supplies. But what do we see? The miners standing firm with a programme of hours and wages for after the war that can only have the effect of producing considerable industrial disorder throughout the country, and of putting a burden upon the country which will be largely destructive to its capacity to meet home needs for all forms of production, and to develop its trade abroad. The last demands of the miners are a 30 p.ct. advance of wages and a six-hour day. There is no justification for this. One labour authority says that in many districts the average earnings of the coal hewers is £1 a day or more; and in the South Wales coalfield the lowest wage paid to labourers working on the surface is 10s. 6d. per day. Under these rates of pay, the 30 p.ct. additional for the coal hewers would represent 6s. a day, while for the surface workers it will be 3s. 3d. The shorter day will result in less production per higher paid man; and therefore the cost of coal-getting will be considerably increased. In other industries there is a corresponding movement in direction, if not altogether in degree. The transitional war-to-peace difficulties are being greatly enhanced by the workers taking the earliest opportunity—and an unfair opportunity—for digging themselves in with higher wages and shorter hours. The movement is spreading; and whatever is done in connection with the miners will be taken perhaps not as the measure of what could be achieved by the workers in other industries, but as a standard the nearest possible approach to which should be aimed for. All this movement does not mean any compensation in increased production. If it did, there would not be much of which to complain. But it does not. The higher costs and the lessened hours mean nothing but a bare heavy burden upon industry, and that the workers where there are excesses are doing their best to strangle the life out of the industries which give them employment.

These are matters which will affect the gas industry's purchasing position, and its own manufacturing costs and trading interests. They will bear upon those large and exigent legislative and financial conditions which were put upon the industry in former days, and which it will have to discuss with Parliament if it does not want to be left with clogs about its feet which will severely hinder activities and progress.

Motorists and Benzol Production and Prices.

WE must be careful our motoring friends do not become our oppressors. In many respects the campaign the Automobile Association and Motor Union have started in connection with home-produced motor fuels is heartily welcome; but there is in it some danger to the producers. Motorists

are being asked to sign a pledge that they will assist the objects that the promoters of the campaign have set before themselves. We agree that the motoring community has a right to ask that the benzol-producing firms, the gas undertakings who have established gas-washing plants for benzol extraction for war purposes, and the shale-oil spirit producers, should be encouraged and assisted to pursue the work. This is precisely what the greater part of the gas industry desires; and the help of the motoring community ought to be of considerable value in getting Parliament to see that the gas industry must have more liberty if it is to continue to recover (as commonsense says it should do) a substance which is of much greater value out of the gas for power purposes than in it for heating purposes. The motoring industry is influential; and we hope more so with Parliament than the reactionaries who appear to lead certain of our local authorities, and who, through mental obtuseness, think that it is a proper thing to oppose at every turn the endeavours of the gas industry to make fresh progress. But the point over which there must be care is that it is stated that it is vital to the motoring community that there shall be "State regulation of the prices of all motor fuel." This is supplemented by the suggestion that there shall be "State encouragement of production of motor fuel wherever "possible within the Empire." To this we have no objection; it is the former suggestion that we do not like. The gas industry has suffered enormously during the war from the State regulation of the prices of their products; and it has had good ground for dissatisfaction, in view of the heavy extra costs it has been put to. State regulation of prices has meant for the industry rigid control on the side of injustice; and it does not want any more of it.

There can be no objection to the State encouraging motor spirit production wherever possible, so long as it does not benefit one industry at the expense, and to the injury, of another. For example, we believe there are sections of the motoring community that have some vision of the electricity industry, at the projected large super-stations, carbonizing or gasifying the coal used, and recovering the benzol. But benzol is not the only product of carbonization; it is not a product that can determine either commercial expediency or success. Thus there would have to be great care taken that this introduction of coal carbonization did not prove a national uneconomy and a commercial misfortune for the electricity industry. The gas and the coking industries are already in existence; and developments in them, especially in the former, should enable a large supply of coke to be available for steam-raising for the generation of electricity. The conservation of our stores of coal is as important nationally as the supply of motor spirit. Moreover, fuel experts are not satisfied that there is any advantage to be derived from the introduction of carbonization or gasification of coal as part of the electrical process. In their report for 1917, the Fuel Research Board directed a douche of cold water on to the ardour of those who had in this respect formed judgment before any investigation as to actualities. Also in the Coal Conservation Committee's final report, it is seen that conferences between the Vice-Chairman of the Power Sub-Committee and the Vice-Chairman of the Carbonization Sub-Committee resulted in an agreement that the introduction of carbonization and gasification processes for the preparation of raw coal as a preliminary to its use for steam-raising is still an open question, and that pending further research on all the issues involved, the only practical course to follow in the planning of super-power stations is to leave room in the original lay-out for the introduction of carbonization or gasification plant should it be subsequently proved feasible, technically and economically. Whatever views, therefore, the promoters of the benzol campaign for motor users may have, it is clear that the time is not ripe for pressing the Government in the direction of benzol recovery at the proposed super-power stations.

However, the programme which the Automobile Association and the Motor Union have prepared to obtain the "advantages" of State regulation of motor spirit prices and the State encouragement of home production of such spirit include these items: To press for immediate State action; to obtain standard specifications; to prevent home-produced fuels being manipulated and controlled by any trust; and to prohibit the export of home produced fuel except supplies surplus to national needs. With these proposals we agree within limits. The one prohibiting export does not commend itself. It indicates that promoters of the campaign are anxious that, useful as some of their proposals would be to the producers of benzol, the latter shall be fenced-in between price regulation and export prohibition, and so have their liberty curtailed. State encouragement of motor fuel production we fear cannot harmonize well with State price regulation and State prohibition of export. The two latter proposals may not in the event prove altogether encouraging. Certain it is there would be no desire on the part of producers to export if good prices were obtainable at home.

Excesses in Labour Demands.

THE movement for shorter hours of work, with the same rates of pay, and even increased rates as in the coal industry, is spreading fast through the industrial world; and the pity of it is that reason is being displaced by a wildness of demand which, if the brake is not applied, will bring about the workers' own undoing by the destruction of the strength of the very industries upon which they depend. There is a dividing-line in economic conditions, on one side of which there is success and prosperity and on the other ruination; and the trade unions are doing their level-best to drive the country over the line to the latter. We believe in every man having a fair amount of leisure and wages that will enable him to live in comfort. But no one can say that some of the demands that are now being made are fair, nor are they creditable to the intelligence of men whose interests must have as great a reliance as those of any other section of the community upon the maintenance of the country's industries in a flourishing state.

Who can defend the proposals of the Clyde workers that their normal week shall be thirty hours (or the forty hours to which a small majority changed the demand), and their rate of pay £1 a day? Who can defend the miners' proposal for a six-hour day, with 30 p.ct. advance on present wages, and piece-work rates rearranged to give the men the same earnings in the shorter hours? And what better encouragement can be given to slackers and idlers than that payment of the full trade union rate of wages should be given to all returned soldiers who fail to obtain employment, and to all civilian workers displaced by demobilized soldiers. There are not a few men who would use their best energies to fail to obtain employment on these terms; and there are not a few among us who would be willing to give up our "jobs" to demobilized soldiers, if income for doing no work was to be on the same level as that of those who are at work. Such ideas as these cannot be treated with seriousness by any working or other man with intellect sufficient to make for himself a clear survey of affairs existent and prospective. Nor can the authors of such extremes in reduction of hours of work and increases of pay (with present to all observers the industrial necessities to-day) commend themselves as having any sane conception of the legislative lines necessary for the building-up with strength of national interests, both internally and externally. At the Southport Miners' Federation conference, there was a distinctly bellicose attitude. Miners, like other men, have been fighting right well against the Teutonic doctrine that might should prevail over right. Nevertheless, the grant of every extravagant claim (including the nationalization of the coal mines), the Government were told by the conference, would be insisted upon by the whole force that 800,000 miners and their organizations could bring to bear. This comminatory attitude is the way that the chief spokesman of the miners selects to make the Government understand that they are in earnest.

Looking at the trade union position to-day, and the spirit of excess that is abroad, we can heartily wish success to the American mission (captained by the level-headed Mr. Sam Gompers) who hope to found a new international trade union movement for the protection of the rights and interests of the workers of all countries on an industrial basis, and free absolutely from socialistic and other political organization. It is this pernicious fusion that has dragged down trades unionism, and sapped legitimate ambitions and the processes of attaining them. Further, we wish success to a healthy movement that has been made at Bradford, which reminds us much of what has been done at the South Metropolitan Gas Company's works, and now at the works of the South Suburban Gas Company. At Bradford, the City Council have approved (in principle) of a draft scheme for the establishment of a Joint Consultative Board, to secure the largest possible measure of joint action between the Corporation and its employees for the development of the various services of the Corporation and the improvement of the conditions of all engaged therein. The gas workers, in

company with the other departments, will have representation on the Board. Among several other matters that will periodically engage the consideration of the new body will be rates of pay, hours, and working conditions. Action will also be taken to prevent differences and misunderstandings between the Corporation and its employees. Encouragement is also to be given to the study of processes, design, and research, with the view to perfecting the services concerned. The scheme extends beyond these matters; but they are indicative of a project which should bear good fruit. Its progress will be watched by us with interest and cordial sympathy.

Dr. Mollwo Perkin on Fuel-Oil Results from Vertical Retorts.

IN a letter in our "Correspondence" columns to-day, Dr. F. Mollwo Perkin comments upon the criticisms we made in the "JOURNAL" for Dec. 24, of the references, in his paper before the Institution of Petroleum Technologists, to fuel-oil results from vertical retorts. The most conspicuous feature of the letter is the omission of Dr. Perkin to controvert specifically the accuracy of the corrections of the money values which he gave in the part of the paper which was the subject of criticism. It will be remembered that our main contention was that the figures as given and certain statements made by Dr. Perkin were unfair to vertical retort working in relation to fuel-oil production, because they (apart from being incorrect) alluded to a period of nascent conditions. We do not say that he was intentionally unfair; but the costs information from which his deductions were made was distinctly imperfect. The statement in the paper that the average amount of distillate obtained was 30 gallons per ton, and that the cost of the oil was 1s. per gallon—*excluding* labour and operating charges—is not defended in the present letter. Nor is there any disputing the authoritative figure which we gave as to the cost of the oil at Nottingham in the months when there was normal working—June, July, and September—and when the cost was in proximity to 5½d. per gallon, *including* labour, operating charges, and making-up any gas deficiency at times when the plant was not working at its full capacity. Our correspondent now inquires, but does not himself mention a figure, as to what were the costs at Dundee and Bradford. Given the same retorts, the same methods of operation, and the same material to be carbonized, there is no reason whatever why there should be any difference beween one works and another.

It is true, as Dr. Perkin points out, that in his paper he declared that "the gas engineers rose to the occasion."

> Perhaps it was right to dissemble your love,
> But—why did you kick me downstairs?

with figures the correctness of which had obviously not been verified; and so the want of virtue was not known to the user. Dr. Perkin fences. As to the £100,000 which he gave as the cost of the "conversion of the retorts," we pointed out that the total cost of any so-called conversion, and of completing one plant, was £50,500, and proceeded to state that a good proportion of the money was laid out on extra condensers, scrubbing plant, and other things required in connection with steaming. "It was," we added, "quite "untrue to say the money—the sum of £100,000!—was "spent on the retorts." "Apparently, then," joyfully remarks our correspondent, "you agree that £100,000 was "spent." It will, we believe, be apparent to all other people that we did not agree. The context shows this. A note of exclamation which appeared after the £100,000 in our article—which "!" did not find place in Dr. Perkin's typewritten letter, but which we have inserted to make the quotation accurate—confirms our disagreement. A substantial part of the money that was expended was for the completion of one plant, and a large portion of the remaining money was spent on auxiliaries, which would have been required anyhow by the adoption of the steaming process for making additional gas per ton of coal, even if "liquid "fuel" had never been heard of in this connection. And, of course, condensers, scrubbing plant, steam connections, and so on are not "retorts." However, Dr. Perkin fails to see that his statement as to the £100,000 was untrue. We are extremely sorry. The difference between us is £49,500! We emphasize the fact that the £50,500 was the total expended on "conversion" and the completion of one plant.

We are fully aware that suggestions were made to the Government to adopt low-temperature carbonizing plants in 1915. But the Government were not at that time in any difficulties in regard to fuel oil; then they were wanting materials for high explosives. The pressure on the Government that we referred to—and Dr. Perkin knows this—was that intensified pressure which was publicly made relatively a few short months ago. He holds that, had the recommendations of the Petroleum Research Department been adopted when made in 1917, there would have been ample time to have completed the erection of low-temperature retorts, and have brought them to a state of production. Could they have had any good effect before the armistice, even if Dr. Perkin's faith in the constructional abilities of the times was really well founded? We knew of the 1917 meeting to which reference is made in the letter, and in connection with which our correspondent seems to think the risk as to result was a small matter—the risk of money, labour, and materials! The Government had to take account of every aspect of the matter; and their conclusion, making a complete survey, was right. In 1918, imports of fuel oil to this country reached a total of 842,356,837 gallons, compared with 440,582,168 gallons in 1917—the increase being due largely to a clever invention of double-bottoms to ships. What could be readily done at home was only a contribution to protection; and the vertical retorts were capable of dealing with the cannel and other high-class oil-producing materials that were available—the restriction to availability being machinery and labour. From the quantity of material available, any difference per ton in the production of oil between low-temperature and vertical retort working would not have justified the heavy expenditure of money, materials, and labour on the former, nor the risk as to results. Dr. Perkin says "we seem to think" he objected to the employment of gas-retorts as a war emergency. What, to him, we may "seem to think" is not actually what we do think. Our only trouble was the virtueless state of the figures that we criticized.

Gas Coal Stocks—Uncomfortable Position.

It is not surprising that the shortage of coal stocks at gas-works has not shown any improvement. The armistice celebrations and the four days' holiday at Christmas had a plenary effect in preventing the provision and despatch of coal for supplementing stocks. It was about the middle of December that the Coal Controller sent the collieries a list showing the position of supplies at various gas-works—the list including 41 works with under one week's supply, 64 with under two, and 28 with over four. We wondered at the time what was the position of the many hundred works not included in these numbers. It was suggested to the collieries that they should give special attention to the works where the stocks were abnormally low. A circular dated Jan. 2 showed 22 works with under a week's supply, against the 41 works a few weeks previously. The works with under two weeks' stocks numbered 67, as compared with 64 in the previous list. And 29 works with over four weeks' supply, compared with 28 previously. Therefore, in December, the works with less than two weeks' supply totalled 105; while the number on Jan. 2 was 89. This indicates, in the circumstance of holiday disturbance, a slight improvement. A further return, has, however, been issued which is worse than the December one. The list shows 48 works with less than one week's supply; 91 with less than two; and 34 with rather over four weeks' supply. Perhaps now that the Christmas holidays are over, and 125,000 miners have been demobilized, and more are returning daily, a better state of things will be quickly brought about. Coal is again coming from the Tyne to London more freely by sea. Days, too, are lengthening; but severe weather is generally expected in the early months of the year. And expectation is just as generally realized. With cold, bad weather, there will be a large pull on the gas-mains; and much coal will have to pass from stock to meet it. So nothing should be left undone to meet the lighting, fuel, and power needs of the community through the gas-mains. In considering the question of supplies, there is a lot said about household coal, but little about household gas. Still there is gratitude to the Coal Controller for his efforts; we would they showed greater success in quantitative results. But there is a more open outlook.

The Government's Electrical Proposals.

The politicians and the newspapers between them have succeeded in arousing a fair amount of public opinion over the

electric power supply schemes; but public opinion has a very vague notion of what is comprised within the proposals. They are hoping for cheap electrical energy; they have little idea as to the frailness of the foundation upon which their hope reposes. The Associated Chambers of Commerce, at their meeting last week, passed resolutions urging the Government to press forward effective legislation so as to secure cheap power supply. Some of the speeches made on the occasion mirrored the uncertainty that exists in business men's minds. One speaker considered the Board of Trade Electric Power Committee's report savoured too much of nationalization; another speaker from Newcastle protested against any such step being taken. Although the resolutions were passed, the speeches made it clear that there would be a large amount of influential opposition to any Government proposal that incorporates nationalization. As to this, the "Daily Telegraph" says its Parliamentary Correspondent learns that "the Government Bill for the creation of a Ministry of Ways and Communications is in a forward state of preparation, and will be laid before the House of Commons immediately after the debate on the King's Speech. As soon as the measure becomes law, Sir Eric Geddes will be appointed head of the department by way of preliminary to the introduction of a great scheme for the nationalization of the railways, the transport services, and the electrical industry."

A Year's Fuel Exports.

The returns have now been published of the shipments of coal, coke, and patent fuel for the past three years. The amount of coal sent out of the country last year was 31,752,904 tons, or upwards of 3 million tons less than in 1917, and more than 6½ million tons less than in 1916. The exports of coke had a severe drop. They totalled only 915,821 tons, which was 362,855 tons less than in 1917, and 565,677 tons less than in 1916. Including patent fuel, bunkers, and fuel for steamers engaged on foreign trade, the total exports of fuel of all descriptions last year was 42,930,391 tons, compared with 48,928,757 tons in 1917, and 54,148,918 tons in 1916. Comparing with 1913—the year before the war—last year 34,173,915 tons of coal, coke, and patent fuel (excluding bunkers) sent out of the country were valued at £52,416,330; while in 1913, the 77,306,554 tons of coal, coke, and patent fuel shipped were valued at £53,659,660. In other words, 43,132,639 tons more were shipped in 1913 than last year (excluding bunkers), but the value was only £1,243,330 more. These are remarkable figures. Of the coal sent abroad last year, 3,080,960 tons are described as gas coal, with a value of £4,448,455. The quantity of coke mentioned above as having been shipped last year is valued at £1,969,153.

Gas Oil and Fuel Oil Imports.

The course of the imports of gas oil the last three years will be interesting to readers who have suffered from shortage of supplies, and the control that has been exercised over its use, which, however, has had educative advantage for gas makers. Last year the imports of gas oil were higher than in 1917, but lower than in 1916. The actual figures were: 1918, 41,079,752 gallons; 1917, 31,303,820 gallons; 1916, 57,074,508 gallons. In view of the difference in the quantities imported in 1918 and 1916, the values are notable. For last year the value is placed at £2,307,394; and for 1916, at £1,213,446, though about 16 million gallons more were imported in the latter year. The quantity of fuel oil imported has had quite a romantic spurt. Last year, the quantity received was 842,356,837 gallons; while in 1917, the total was 440,582,168 gallons, and in 1916 only 22,556,604 gallons. The value last year was £23,984,500, as compared with £9,427,449 in 1917.

Demobilization.

As announced in the Press, the employees of public and local authorities and of public utility undertakings have been included as one of the "open groups" registered for the early demobilization of their employees from the Forces. We learn that the National Gas Council have been informed by the Ministry of Labour that special steps will be taken to secure the early release of a small number of gas stokers, whose return to work is of particularly urgent importance. If, therefore, gas undertakings will notify the Council of such cases, they will undertake to put them forward in the right quarter for attention.

THE NATIONAL GAS COUNCIL.

THE following meetings have been arranged for Tuesday, Feb. 18, to be held at the Central Hall, Westminster, S.W.

At 10.30 a.m. there will be a meeting of the original National Gas Council, corresponding to the second annual meeting due to take place in October last, but postponed on account of the reorganization of the Council then in contemplation, and since carried into effect. At this meeting, the work of the Council will be formally handed over to the new body.

At 11.30 a.m. a meeting of the reconstituted National Gas Council will be held, when the nominations for membership of the Central Executive Board will be received from the District Executive Boards, and Office-Holders and Committees will be appointed. This meeting will be followed immediately by

A meeting of the separate Committee of Gas Employers for the election of Officers, &c., and the transaction of business.

At 3 p.m. there will be held the first meeting of the Central Executive Board.

GAS COKE SUPPLIES.

THE National Gas Council have been informed by the Coal Mines Department of the Board of Trade that, in view of complaints having been received that stocks of gas coke are increasing in certain districts, gas coke may now be disposed of on the following conditions:

(1) In districts where stocks exist and the gas companies are desirous of disposing of their coke, supplies under the Household Fuel and Lighting Order to steam laundries, steam bakeries, florists, or other quasi-industrial concerns at present covered by the Household Fuel and Lighting Order, may be given in full of gas coke instead of the percentage reduction stipulated by the Household Fuel and Lighting Order.

(2) Demands for industrial coke as to quantities and transport are unrestricted. Further, any assistance which the steam-raising department can give in districts where surplus exists to assist industrial users will be afforded on application from any gas company or undertaking to the office of the Controller of Coal Mines, Holborn Viaduct Hotel, London, E.C.

TAR OILS ORDER.

IN reference to the Tar Oils Control Order, dated Feb. 1, 1918, the Minister of Munitions hereby orders as follows:

(1) The operation of the said Order is hereby suspended on and after Jan. 15, 1919, until further notice.

(2) Such suspension shall not affect the previous operation of the said Order or the validity of any action taken thereunder, or the liability to any penalty or punishment in respect of any contravention or failure to comply with the said Order prior to such suspension, or any proceeding or remedy in respect of such penalty or punishment.

(3) This Order may be cited as the Tar Oils Control (Suspension) Order, 1919.

Speculating in Sulphate of Ammonia.

In the Bankruptcy Court, before Mr. Registrar Mellor, Mr. Roger W. Wallace, Barrister-at-Law, last week, applied for his order of discharge. From the report of the Official Receiver (Mr. J. B. Knight), it appeared that the debtor failed in 1913. The debts which were provable amounted to £72,725; and the assets were valued at £75,764. They consisted, however, chiefly of patents which were unrealizable. A first dividend of 1s. 5½d. in the pound had been paid; and a further dividend of 1½d. was expected to be declared. In 1873, the applicant commenced business as a chemical merchant. Some six years subsequent to this he attempted to hold the market for sulphate of ammonia against a combination of other people; and having purchased, or contracted to purchase, stock to the value of £100,000, he found that, owing to his financial position, he was unable to carry out the project. The result was he had to make an arrangement with his creditors. Their claims amounted to £150,000; and many of them received payment in full, while others had received a dividend. He was interested in chemistry, and experimented a good deal. He was also busy with electrical discoveries and other scientific matters. He was interested in some 27 companies formed for the working and development of new discoveries and ventures; and he estimated his loss in connection with these undertakings at £100,000. The chief offence reported by the Official Receiver was that of rash and hazardous speculation. The Registrar said that the applicant appeared to have become interested in various projects which, if carried through, would all have been beneficial to the community at large. He felt, however, that he must uphold the view expressed by the Official Receiver with regard to rash and hazardous speculation; and the discharge would be suspended for three years.

PERSONAL.

At the meeting last Tuesday, Mr. JAMES D. SMITH, the Engineer and Manager of the Belfast Corporation Gas-Works, was elected a member of the Institution of Civil Engineers.

Mr. HARRY WARD, who has been for some years connected with the electrical department of Warner's Foundry at Walton-on-the-Naze, last week took up the position of Secretary of the Brightlingsea Gas Company in succession to Mr. J. Matlock.

Sergeant WILLIAM WATMOUGH, of the 66th Division Signal Company, Royal Engineers, now stationed in South Belgium, has been awarded the D.C.M. Sergeant Watmough is an employee in the Meter Stores (Whitworth Street West) of the Manchester Corporation Gas Department, and enlisted on the day after the declaration of war.

Lieutenant-Colonel WILLIAM REID GLOVER, D.S.O., has been mentioned in despatches for the third time; and the King has bestowed upon him the Order of the C.M.G. Lieutenant-Colonel Glover is a Director of Messrs. Glover and Main, Ltd., and of the allied Companies of Messrs. Thomas Glover & Co., Ltd., and Messrs. R. & A. Main, Ltd.

Mr. W. RITCHIE has resigned the position of Gas Manager and Lighting Inspector to the Peterhead Town Council, owing to having taken up work of another nature. He has been 23 years with the Council, and for 13 years Gas Manager. The Provost and other members expressed regret at the resignation, and paid tribute to the excellent work done by Mr. Ritchie in connection with the gas undertaking.

In addition to the names mentioned last week, in the matter of awards for services in connection with the war, Mr. W. J. JONES, of the Iron and Steel Production Department of the Ministry of Munitions, and Managing Director of the Woodall-Duckham Company, Ltd., has been promoted to Knight Commander of the Order of the British Empire. Mr. THORPE FOSTER, Manager of the Low Moor Company's new works coke-ovens, has had conferred upon him Membership of the Order. Mr. Foster, by skilful resource and personal attention, was able to secure a rapid recovery of operations at his plant after a series of disastrous explosions at a munition works in the neighbourhood, which caused extensive damage to the coking and bye-product plants. It took several months to fully restore the normal state of affairs; but, by temporary expedients, Mr. Foster was able to have his plant fully at work again within a week.

Prof. JOHN W. COBB, Livesey Professor of Coal, Gas, and Fuel Industries in the University of Leeds (whose appointment as a Commander of the Order of the British Empire was intimated last week), has been occupied with several forms of war work for the Ministry of Munitions. As Deputy Inspector of High Explosives (Leeds Area), he has been responsible for the inspection, testing, sentencing, and grading of the varied requirements of the army and navy of the high explosives manufactured in the County of York. In his care has also been the chemical control, on behalf of the Department of Explosives Supply, of the tar and oil washing processes used in the gas-works in the counties of York and Lincoln, for increasing the supplies of benzene and toluene, the essential raw materials for the manufacture of high explosives; and he has carried out research into the conditions which determine the maximum preservation and minimum decomposition of benzene and toluene in the carbonization of coal as carried out in gas-works and bye-product coke-oven plants. He was appointed Adviser on Furnaces to the Department of Optical Munitions and Glassware Supply, which has been concerned specially with the production of chemical and optical glass, a branch of the industry which had been allowed to go abroad; and incidental work has been done in his laboratories during the war on the annealing of copper shell bands, and for the Department of Inland Water Transport and the Aeronautical Inspection Department. Prof. Cobb has been entrusted by the Institution of Gas Engineers with the supervision of research carried out under the direction of a Joint Committee of the University of Leeds and the Institution of Gas Engineers, into the comparative efficiencies in use of different grades of gas, in order to throw light on the urgent question of new legal standards, which the extraction of benzene and toluene from coal gas necessitated, and the changing condition of manufacture and use demand.

OBITUARY.

Lieutenant-Colonel J. A. RAYMOND THOMPSON, D.S.O., Croix de Guerre, commanding the 5th Yorkshire Regiment, who has been missing since May 27, and is now reported killed on that date, was a Director of the Malton Gas Company. He had been three times wounded.

The death took place on the 15th inst., of Mr. W. E. PETTIGREW, one of the officials of the Leeds Corporation Gas-Works. He broke down in health during last summer. Educated at the Leeds Modern School, he then entered the laboratory at the New Wortley works. He made rapid progress, and for the past twenty years had occupied the position of Manager of the gas-works in York Street. Altogether Mr. Pettigrew (who was 43 years of age) had been with the Corporation for twenty-five years.

GAS BILLS FOR 1919.

[We shall be pleased to receive notification from Parliamentary Agents and others as to any late promotions of Gas Bills that may have been made, in accordance with the intimation of the Lord Chairman of Committees that such promotions would be entertained this session.]

[THIRD ARTICLE.]

WE conclude to-day the review of the Gas Bills promoted for the coming session of Parliament—so far as they are at present in evidence.

In a General Powers Bill, the Stockton-on-Tees Corporation ask for authority to purchase residual products from other gas undertakings, "provided that, after the termination of the present war, the quantity of any residual product so purchased by the Corporation in any year shall not exceed one-third of the quantity of the like residual product which shall in that year arise directly or indirectly from the manufacture of gas by them: Provided also that the Corporation shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Corporation or purchased from other gas undertakings is merely subsidiary." [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

From the preamble of the Bill promoted by the Stourport Gas, Coal, and Coke Company, Ltd., it is learned that the capital is £6600, and that the Company have not borrowed any sums on mortgage. Between 1908 and 1917 sums exceeding in the whole £5200 were from time to time taken from undivided profits, and expended in enlarging and improving the structural works and plant. Also out of undivided profits £3400 has been provided as working capital. A structural valuation of the Company's property amounts to a sum exceeding £20,000. It is therefore submitted that it is reasonable that shares representing the sums that have been so expended should be created and distributed rateably among the present members of the Company. At present there is no restriction as to dividend. Coming to the clauses, the limits of supply are defined, and the incorporation of the Company, under the title of the "Stourport Gas Company," is provided for. It is contemplated that the capital shall be £39,800, of which £19,800 is to be ordinary stock (and called "original capital"), and £20,000 to be additional capital. The division of the original capital, it is suggested, shall be at the rate of £15 for every £5 share in the limited Company. A clause follows giving power to raise the additional capital, as well as one for the borrowing of £6600 in respect of the original capital, and up to one-third part of the paid-up additional capital. Dividend on the preference shares is not to exceed 6 p.ct., on the original capital 5 p.ct., and on the additional capital issued as ordinary 7 p.ct. The succeeding clauses are mostly of common form. It may, however, be noted that annual meetings are arranged for. The works and lands clauses include the "Model" form of residuals provisions, not excepting the one-third restriction. In the clauses relating to the sliding-scale, it is proposed that the standard price within a radius of one-and-a-half miles from the existing gas-works shall be 5s. per 1000 c.ft., and beyond this radius 5s. 6d. A calorific power standard of 500 B.Th.U. is proposed; and Simmance's total-heat calorimeter is specifically designated as the instrument to be used. A maximum pressure of 1 inch is suggested. [*Parliamentary Agents: Messrs. Sharpe, Pritchard & Co.*]

The Sunderland Gas Company have a scheme in hand for extending their area of supply, and purchasing the undertakings of two non-statutory concerns—the South Hylton Gas Light and Coke Company, Limited, and the Whitburn Gas Company, Limited. The Sunderland Company's original capital amounts to £90,600, bearing a maximum dividend of 10 p.ct., except £8000 of preference, which carries a dividend of 5 p.ct. The paid-up additional capital is £62,500 (out of an authorization of £100,000), with a maximum dividend of 8½ p.ct. This capital it is desired shall be converted and consolidated. By their Act of 1857, the Company were not empowered to raise any money on mortgage or bond; but they were permitted to continue on mortgage or bond all such sums as had been previously borrowed by the "Sunderland Corporation Gas Company" (which was the original title of the Company) until they had been paid off. This has since been done. To the acquisition by the Company of lands at Hendon and Ayres Quay, and the construction of works thereon, sanction and confirmation are desired, and the works are to be deemed to have been lawfully constructed. Powers are sought as to additional lands at Hendon and Ayres Quay, as well as in respect of the lands of the Whitburn and South Hylton Gas Companies. Protection as to railway sidings is given to the Hendon Paper Works Company and the British Petroleum Company, Ltd. Power to stop up a roadway is also sought. The intentions as to the extension of the limits of supply are described in detail; and then authorization is asked to the purchase by agreement of the properties of the South Hylton and Whitburn Companies. The proposal as to the conversion of the capital is that there shall be one class of stock, entitled to a maximum dividend of 6 p.ct. per annum. The scales of conversion are: For every £5 of original capital, £8 6s. 8d. of ordinary stock; and for every £5 additional capital, £7 1s. 8d. of ordinary stock. It is proposed to repeal the unexercised capital powers of the Act of 1857, and to ask for additional capital to the amount of £200,000, which is to

be part of the general capital. Borrowing powers are sought up to one-half of the issued capital. Debenture stock powers are also required, together with authorization as to the issue on redeemable terms. Provisions as to the supply of power gas, the formation of a benefit fund, and the granting of pensions are also included. The Company seek to be allowed to charge not exceeding 1s. per 1000 c.ft. extra for gas in the added limits of supply than the price charged in the existing district. Power to purchase gas from outside persons or bodies is sought. Annual meetings are proposed, which are to be held "within four months of the end of the financial year." [*Parliamentary Agents: Messrs. Sherwood & Co.*]

SCOTTISH PROVISIONAL ORDER.

Under the Edinburgh and Leith Corporations Gas Act, 1898, the Commissioners acquired an extensive area of land at Granton, and certain other important rights referred to in the agreement scheduled to, and confirmed by, the Act, and on part of the lands constructed new gas-works. The exercise of the powers for the construction of the subsidiary works Nos. 1, 2, 3, and 5 described in, and authorized by, the Act, is dependent on the development and extension of the gas-works on the remaining part of the lands. By the Edinburgh and Leith Corporations Gas Order, 1908, the time limited by the Act of 1898 for the construction and completion of the works in question was extended to May 23, 1920. The extension of the new gas-works at Granton on the remaining lands acquired for the purpose, and the construction of the subsidiary works not having yet become necessary, it is expedient that the time-limit should be further extended. Clause 4 of the Bill which has been lodged, therefore, reads: "The time limited by the Act of 1898 for the construction and completion of the works Nos. 1, 2, 3, and 5 thereby authorized as extended by the Order of 1908 is hereby further extended, and shall continue in force for a further period of fifteen years from May 23, 1920." [*Parliamentary Agents: Messrs. Beveridge & Co.*]

BOARD OF TRADE PROVISIONAL ORDER.

The Elstree and Boreham Wood Gas Company, Ltd., ask, in a Provisional Order lodged with the Board of Trade, for power to raise further share capital not exceeding £24,000, provided that the total share capital shall not exceed £50,000. The conditions contained in the Order of 1899 are to apply to the new capital. Borrowing powers up to one-third of the issued capital are sought; the rate of interest not to exceed 6 p.ct. For the part of the new capital issued as ordinary, the limit of dividend is put at 7 p.ct., and on the part issued as preference 6 p.ct. Powers as to the continuance, construction, and maintenance of works are sought, and residual products provisions are appended, and, properly, without the one-third purchase restriction. [*Solicitors and Agents: Messrs. Hubbard, Son, and Eve.*]

ELECTRICITY SUPPLY MEMORANDA.

LABOUR has a profound interest in the regeneration of the electricity industry. It recognizes in the proposal something that will be politically and militantly useful. Many months ago now labour, with a watchfulness which does credit to its adoption and practice of the doctrine of opportunism, asked that it should be represented on any body to be appointed to deal nationally with the reformation of the electrical services of the country. Recently the railway men obtained an assurance from the Premier that railways and transport generally, including electric traction and power, were to be dealt with on a national basis by legislative schemes which would be introduced as early as possible after the new Parliament had properly got to work. Now labour is dreaming of the nationalization of railways, transport, and electricity supply, so far as this refers to transport, power, and bulk supply to cities and towns. There has been no proper investigation of these matters to justify the adoption of the theories in these respects of an advanced section of those who are the most active forces in trade unionism to-day. We should not have the slightest objection to labour taking part in the direction of enterprise, if it meant the creation of greater harmony and united effort. These effects are realized in the two co-partnership gas companies where employee co-partners have representation on the Boards of Directors. In these circumstances, however, the conditions are different, the workers having a financial interest in the concerns. One wonders whether the presence of labour on the body entrusted with the promotion of a national scheme of electricity supply would be solely for the purpose of serving the ends of labour, or for genuinely assisting in promoting the best interests of electricity supply? If the object is merely the former, then labour has no right to preferential conditions in any national scheme in order to promote benefits for one section only of the community. If "national," "nationalization," and such-like terms have not meanings which comprehend the whole interests of the community without preference, then the country had better keep clear of projects that are falsely so labelled.

Labour and Electricity.

There is another matter the Government and the country should keep in view; and it is that the grandiose scheme for the construction of super electric power stations is going to place in the hands of militant labour a weapon of untold value. Of course, the idea that there shall be only sixteen super-stations in the country is altogether erroneous; the division of the country into sixteen areas does not mean that there will be only sixteen super-stations. The intention is that electricity generation shall be largely concentrated; and it has been pointed out before that in times of war these stations will form excellent centres for mischief by an enemy. Before then consideration will have to be given to those whose indifference as to the choice of weapons for gaining their objective appears to be growing rather than diminishing. There was lately a total suspension of the Lancashire and Yorkshire electric train services between Liverpool, Southport, and Ormskirk, due entirely to a strike of the electrical workers at the Formby power station. Their only grievance was that, though they have inclusion in the forty-seven hour week, it did not come into operation with them until a month hence; and they were not prepared to wait that length of time. Then, again, the part of the people of Grimsby depending on electricity for light and power the other day experienced the ease with which the discontent of employees at the electricity station could be translated into public inconvenience. Suspension of the business of private consumers who depend upon electricity and of the tram service, the abandonment of a performance at the theatre, with the post office work conducted by the aid of candles, were among the incidents of the stoppage. Just picture a large area of the country dependent upon a super-station for energy for traction, the factories for power, and the cities and towns for electricity; and all this placed at the mercy of a handful of men discontented with wages or hours, or upset over some comparatively speaking trumpery matter. If there is persistence in huge concentrations of generating plant, electrical labour will have something at hand of a very powerful character. As things are going in the labour world, a reasonable sequestration may be a far better policy than extreme concentration.

A Powerful Weapon for Electrical Labour.

It is, of course, not humanly possible that the electric supply schemes of the Government can be matured to any considerable extent for some years to come. The present year will be occupied with parliamentary proceedings; and then, if a year hence, the Board of Electricity Commissioners is set up and the District Boards formed, it will take time to perfect plans, let alone commence their materialization. The suppression of uneconomical stations cannot be done in a day; and the constructional work for new stations and transmission will demand time at present immeasurable. It's a long, long way to the realization of the ideals. The time has to be bridged-over; and, so far as we can see from the intelligence published in the electrical papers, the owners of most electrical undertakings are proceeding as though nothing had been breathed respecting national schemes. Glancing through the news items of one paper last week, it is seen that several proposals are being forwarded which will not, if sanctioned, make the way smoother for the schemes of the Government. Burnley is cautious. The Corporation have inquired of the Board of Trade as to what is the probability of permission being granted to an extension of the electricity station. The reply from the Board was that certain outstanding questions of policy are at the moment awaiting decision; and it is hoped within two or three weeks to indicate more or less definitely what should be done. On the other hand, Bolton has entered into an agreement with the Lancashire Electric Power Company for a working arrangement for ten years. The Stretford District Council have come to terms for the purchase of the Trafford Power and Light Company's property and rights. The West Bromwich Corporation have agreed to purchase current from the Midland Power Corporation. The Llandudno Council have concluded a new agreement with the Llandudno and Colwyn Bay Railway Company. The Maidstone Corporation have obtained the sanction of the Local Government Board to extensions. At Aberdeen, a scheme is ripening for the construction of railway communication with the electricity station. The electrical papers have also been describing the large electrical station at Rotherham, and what is being done at Sheffield. And all these matters are found in a single issue of an electrical paper; and they are therefore only examples of what is happening week by week external to the greater, but as yet extraordinarily vague, projects.

Reinforcing Existing Conditions.

The electricity industry, in the development of business, has its *post-bellum* problems to face. Its big super-stations (when they come along) do not hold out much hope of producing economy in anything but fuel. Highly placed experts rather anticipate that any economy in this direction will be offset by greater costs in other directions—capital and distribution; while from such stations there will be no chance, as with small local stations, of developing that rather doubtful bye-product scheme, hot-water distribution in the immediate locality. On the whole, one does not see any chance of an immediate sharp fall in the prices of current and energy. As to installations, Mr. H. Marryat, in "Electrical Industries," estimates that wiring

Heavy Increase in Installation Costs.

costs have advanced 150 p.ct.; and now old-time customers have less to spend. Referring to this, our contemporary says: "As the cost of wiring has always been one of the most formidable obstacles to the progress of the domestic uses of electricity, the rise from (say) £1 per point to £2 10s. per point is a most serious aggravation of the difficulty." It seems impossible to devise anything that will neutralize this condition; but Mr. Marryat is hopeful that the costs will yield a little to intelligent plans. He would in future weed out incompetent men, standardize wiring systems, and adopt labour-saving methods. But the men now work a shorter week; and they wink knowingly at each other when there is talk of increased man efficiency. They interpret "man efficiency" to mean more work per man in a given time. The standardization of wiring systems is an old ideal, and is still being discussed. The scope for the application to installation work of labour-saving appliances is not very great. However, our contemporary points out that the "Electrical Contractor" is optimistic on the whole subject. It says: "There is limitless work to be done. Output must be increased to compensate for and overlap the increase of wages. This seeming impossibility can be achieved, and easily, if master and man have a will to do it, and are shown the way." We have always understood that there is great virtue in an "if."

The Consumer the Economizer.

The increase of electrical installation costs, the competition of gas that offers a greater amount of thermal energy in comparison with electricity for a given price, the lessons of war time as to what can be done in the way of economy will influence householders and others very largely in the matters of new or extended electrical patronage in the future. The restrictions that rationing has imposed have not been an altogether unmixed evil. Since the Coal Controller gave 25 p.ct. greater liberty to the consumption of gas and electricity, a tradesman in the West-end of London has stated that he did not particularly want the concession. The reason he gave was that the requirements of the Coal Controller had shown him that the consumption of current on his premises had previously been excessive, and so money was being unnecessarily wasted. He therefore intended to profit in future from the lesson he had learned. This tradesman would never have had the opportunity of learning the lesson had it not been for the coal troubles due to the war; and he would still have gone on in the same old uneconomical way. Sir Guy Calthrop may plume himself upon the fact that his office and his methods have effected some permanent good. Touching this point, we see that "Electrical Industries" deplores the serious effect that restriction has had upon makers and sellers of electric cooking, heating, and other auxiliary apparatus. A good case, it says, "could have been made out for the encouragement of such apparatus for the saving of coal; and it is worth making out yet, as the necessity for economizing in fuel and transport is still with us." The sense of humour has robust existence in the region of electrical journalism. The strong case runs somewhat as follows: The average coal consumption in the country per unit of electricity delivered is (say) 4½ or 5 lbs. of coal having a thermal value of 60,750 B.Th.U. The pigmy result of this use of coal is the delivery of 3420 B.Th.U. by wire to the consumer, or an efficiency of 5·6 p.ct. Is this the "good case?" "But then," urges the electrical man, "look at the efficiency of our appliances." A coal fire with a 20 p.ct. efficiency would give the householder from the quantity of coal mentioned 12,140 B.Th.U. usefully employed, in place of the 3420 B.Th.U. assuming for fun 100 p.ct. efficiency for electric appliances!

Frozen Gas-Pipes.

Referring to frozen gas-pipes last winter in New York City, Mr. Robert Livingston says that the Consolidated Gas Company of New York had 215,385 complaints of frozen pipes during the three months of December, January, and February. Some of these were duplications; but in most instances they could be counted as single complaints. The duplications generally occurred in large apartment houses, where several tenants were affected and reported separately. In 1913, the Company had no complaints of this nature; while the average for five years, back in those days, had been only 1242. He suggests that it would not be out of place for gas companies to issue a notification to consumers, directing attention to the fact that gas-pipes exposed to extreme cold are likely to give poor service in dead of winter, because through the walls of gas-pipes that contain moisture, freezing chill is conducted to the moisture, which when frozen in the pipes reduces the diameter of the opening, and thus reduces the volume of gas delivered to the consumer. Such a statement might be followed by directing attention to the fact that broken windows, partially open windows, cracks about doors of cellars, and other things that unnecessarily expose gas-pipes to the cold, are frequently the reason for the consumer's inconvenience. In the extreme cold period, the Consolidated Company operated nine trucks in widely separated sections of the city, each carrying a steam-boiler heated by gasolene; this equipment being moved from place to place, and used day and night in thawing-out pipes. This method of handling the trouble was quite new, but was found a very great relief to the consumer. Where basements are not heated, the service-pipes and risers in the walls are apt to freeze so solid that the gas in some instances is completely shut off,

FALLING PRICES OF MATERIALS.

Report of the Government Committee.

EARLY last year, a Committee on Financial Risks Attached to the Holding of Trading Stocks was appointed by Dr. Addison, who recognized that fear on the part of manufacturers and traders of losses due to a fall in prices of raw material bought at wartime rates would tend to cause reluctance to embark upon full-scale production after the war, and would thereby retard the attainment of maximum national productiveness. The idea was that the Committee should form an opinion as to any measures which could be adopted with a view to securing that manufacturers and others should be financially in a position to hold stocks after the war, and that reasonable safeguards should be established to prevent serious financial losses in respect of stocks of materials required for industry, as a result of possible depression following upon a period of great inflation.

In their report, which has just been issued, the Committee express the view that apprehension of loss due to a drop in prices is well founded; and they regard it as most desirable that the position of industry should be specially strengthened, when on the threshold of a period in which markets have to be re-organized or created, and in which industrial conditions are in the highest degree uncertain. They think that the most hopeful line of approach to a solution lies in a reduction of the present rate of excess profits duty—which "encourages extravagance and discourages enterprise." The Committee recommend two alternative remedies.

1.—A reduction in the excess profits duty from 80 to 65 p.ct. for the accounting period approximating to the year 1918 now in course of assessment, on the understanding that the duty so remitted is retained in the business, and not distributed. This reduction might be accompanied by the withdrawal of the concession by which an allowance is made for the fall in the value of stocks held in the last accounting period, to the extent to which they are realized in the succeeding two years. This concession was largely a result of the raising of the duty to 80 p.ct.

2.—If this course is impracticable, the Committee suggest that part of the duty now to be paid should be treated as a suspensory reserve for a period of five years—the amount so treated to be represented by a special kind of war loan, to be held on joint account by the Government and the taxpayer. The amount of this reserve should be 20 p.ct. of the average excess of profits in the last two years of the duty. After five years, this reserve should either revert finally to the State or, in the following circumstances, become wholly or in part the property of the taxpayer. He must show that his annual profits over that period are less than the amount of the percentage standard to which he was entitled or would have been entitled under excess profits duty; and that these deficiencies have been associated with the holding, during this period, of stocks at falling prices, as distinct, for example, from bad management or reduced turnover. He would be entitled to relief to the extent of 80 p.ct. of the deficiency; but for no greater sum than the amount of the reserve.

The Committee recognize that they have been unable to formulate a scheme of relief for those who pay no excess profits duty. They also consider that a business which has denuded itself of its "immanent stock," at the instance of the Government, to meet immediate needs, has a claim for consideration which is best preferred to, and granted by, the Department of State to which the assistance was rendered.

Manchester and District Junior Gas Association.—The Association were to have visited the works at Ashton-under-Lyne of the National Gas-Engine Company on Feb. 1; but the Hon. Secretary (Mr. J. Bridge) intimates that, owing to extensions and the shortness of the days, it has been arranged that the visit shall be postponed until March 1.

Cannel and Anthracite Coal.—In an address entitled "New Light on Some Coal Problems," Prof. P. F. Kendall, of the University of Leeds, indicated to the members of the local Geological Association the nature of the work undertaken by the Department of Geology at the University. After explaining that coal presented three distinct types of material, he went on to say that the department did not regard cannel as true coal; and after studying a very large number of cases underground and in sections, the opinion had been formed that cannel consisted of the ordinary coal constituents that had undergone decomposition in a pool of water. It was, however, only partial decomposition, not going as far as in the case of ordinary coal. Cannel was nearly always associated with fish remains, another proof that it was formerly in a pool. Anthracite—the extreme form of natural carbonization—was one of the subjects now under consideration; and it was possible to explain why the ash constituent was so extremely low. This was ascribed to the absence of the sparry material which filled the joints in ordinary coal. Anthracite was not traversed by the joint called cleat in coal. Cleat itself was being investigated, both by personal observation and by a very extensive correspondence with colliery managers all over the world. A very remarkable fact had been ascertained—namely, that the compass direction of the cleat was almost uniform throughout the Northern Hemisphere. A tentative conclusion was that it must be a planetary phenomenon—that it was in some way due to the behaviour of the earth.

THE VALUATION AND METHODS OF ANALYSIS OF SPENT OXIDE.

By HAROLD G. COLMAN, D.Sc., and E. W. YEOMAN, B.Sc.

II.

DETAILED ANALYTICAL METHODS FOR ESTIMATING FREE SULPHUR.

Sampling the Bulk of Spent Oxide.—Any differences in the test between buyer and seller probably arise to a larger extent from inaccurate sampling of the bulk than from any other cause. Cases have been known in which the sulphur content of the samples drawn of the same bulk by the seller on loading and by the buyer on delivery has differed by as much as 5 p.ct. For this sampling, the procedure laid down for the sampling of coal, &c., in bulk should be adhered to, and the quantity taken reduced by crushing and quartering to quantities of not less than 1 lb., which are at once placed in sealed tins or bottles.

Preliminary Treatment of the Sample.—Before carrying out the analysis, the whole of the sample is further intimately mixed and ground. For this purpose the entire contents of the bottle or tin are crushed in a mortar to pass a 10-mesh sieve, thoroughly mixed, and reduced, by quartering, to a quantity of about 200 grams. This is further ground in a mortar to pass a 30-mesh sieve, again thoroughly mixed, and stored in a well-corked bottle.

In some instances the sample is so wet and tarry that the crushing in a mortar is found impracticable. In such cases the sample is mixed as completely as possible after crushing any lumps present, and reduced by quartering to about 200 grams. This is accurately weighed into a basin and heated on the water bath (with frequent stirring) until it becomes sufficiently dry for crushing in the mortar, and the loss of weight occurring is noted. The partially dried material is then crushed to pass a 30-mesh sieve, and thoroughly mixed; due allowance being made in the subsequent analysis for the amount of water lost in the preliminary drying.

Weight of the Sample taken for Analysis.—In order to obtain greater accuracy, it is frequently recommended that a quantity of 5 grams, or even 10 grams, should be taken for analysis. We find, however, that no advantage as regards accuracy is obtained by taking a larger quantity than 2 grams, provided that the sample has been thoroughly crushed and mixed, whereas the time required for the analysis is increased. The larger the quantity taken, the more difficult is it to get complete extraction of the sulphur from the material, and to eliminate the solvent completely from the extracted sulphur.

Loss at 100° C.—The percentage loss of weight of the sample at 100° C. is usually taken as representing the quantity of moisture in the sample. Strictly speaking, while the great bulk of this loss is due to moisture, the spent oxide at 100° C. loses small amounts of hydrocyanic acid from the cyanogen compounds present, as well as lower boiling tar constituents, such as naphthalene. In order to determine it, 2 grams of the sample are weighed-out and heated for one hour in the water-oven at 100°, and weighed after cooling in the desiccator. The heating in the water-oven is then continued for another half-hour; and if the further loss of weight does not exceed about 1 milligram, the drying is regarded as complete. Long continued heating must be avoided, as sulphur itself is by no means completely non-volatile at 100°, and prolonged heating therefore causes appreciable loss of sulphur.

Extraction of Crude Sulphur plus Tarry Matter.—The dried spent oxide thus obtained is transferred, by means of a camel-hair brush, to a filter paper Soxhlet thimble, and extracted with freshly distilled carbon bisulphide for two hours in the Soxhlet apparatus. The flask used should be of about 300 cc. capacity, and is dried by heating before use, blown out with air, and then allowed to stand for 15 minutes in the balance case before weighing. The carbon bisulphide is distilled off as completely as possible on the water-bath, and when no more passes over, a cork, carrying an inlet and outlet tube, is placed in the flask, and a current of air, previously dried by calcium chloride, is drawn for 15 to 20 minutes through the flask still immersed in boiling water, to remove the carbon bisulphide. The flask is then well dried and weighed after standing 15 minutes in the balance case. The increase of weight in the flask gives the weight of sulphur *plus* tarry matter extracted.

DETERMINATION OF FREE SULPHUR IN EXTRACT.

(*a*) *By Modified Davis and Foucar Method.*—About 80 cc. of methylated spirit and about 4 grams of commercial 98 p.ct. cyanide are added to the residue in the flask, which is boiled for one hour on a reflux condenser, after which the alcohol is distilled off, and water added, the solution filtered, the residue washed, and the filtrate made up to 500 cc. Of the solution, 50 cc. is taken, made just acid with sulphuric acid after adding about 1 gram of sodium sulphite, heated to boiling, and then precipitated with excess of copper sulphate solution. The precipitated cuprous thiocyanate is at once filtered off on the pump through filter paper pulp [*ante*, p. 23] and washed with water. The filter paper pulp and precipitate are washed into a beaker and warmed with water and about 2 grams of caustic soda or sodium carbonate (free from chloride), and again filtered through pulp and washed. The filtrate is acidified with sulphuric acid and nitric acid (free from nitrous and hydrochloric acid), a solution of ferric alum added as indicator, and titrated with N/10 silver nitrate solution until the red colour of the ferric thiocyanate just disappears. Each cc. of the N/10 $AgNO_3$ will correspond to 0·003206 gram of sulphur; so that as one-tenth of the total solution from the 2 grams of spent oxide was taken, the total sulphur is equal to cc. N/10 $AgNO_3 \times 10 \times 0{\cdot}003206$.

(*b*) *By Marsden's Sulphuric Acid Method.*—15 cc. of 95 p.ct. sulphuric acid is added to the residue of sulphur *plus* tarry matter obtained by extraction of the spent oxide, and the flask heated for 2 hours in the water-oven. After cooling, the contents of the flask are poured into water, the flask well washed out with water, the solution and washings filtered, washed, dried, and again extracted with carbon bisulphide in the Soxhlet apparatus for 2 hours. The carbon bisulphide is distilled off as before, and dry air passed over the heated residue for 15 to 20 minutes. The dried flask is then carefully heated on the sand-bath till the sulphur is just melted; care being taken to avoid loss by overheating and distillation. When the flask is nearly cool (but not before), air is blown through the flask to remove vapours from it, after which it is allowed to stand for 15 minutes in the balance case and then weighed; the increase in weight giving the true weight of free sulphur in the quantity of spent oxide originally taken.

(*c*) *By Modified Sulphuric Acid Method.*—In this method, the residue of sulphur *plus* tarry matter obtained by the first extraction is redissolved in carbon bisulphide and transferred to a stoppered separating funnel (washing-out the flask with carbon bisulphide), or the carbon bisulphide extract may be at once transferred to the separating funnel without previous evaporation of the solvent. About 15 cc. of 95 p.ct. sulphuric acid is added, and the whole shaken until the solution assumes a pale yellow colour, which generally requires less than a minute. After settling, the sulphuric acid layer, together with enough of the bisulphide solution to carry with it the black insoluble matter formed by the action of the acid on the tarry matter, is run off into about 200 cc. of water. The acid solution and a small amount of bisulphide solution are filtered (most readily through pulp, with the pump) into the bisulphide solution left in the separating funnel, washing-out the filter with a little carbon bisulphide. After thus separating the black insoluble matter, the aqueous and bisulphide layers separate completely, the former being then run off; the carbon bisulphide solution washed twice with water, and dried with ignited calcium chloride. The solution is then filtered into a weighed flask; the filter paper and drying material washed with a little carbon bisulphide; and the latter distilled off, the residue subjected to a current of dry air, fusion, and weighed, as in (*b*).

The following selection of tests made with typical samples of spent oxide, and also with pure sulphur and mixtures of iron oxide, pure sulphur, and tar, gives an idea of the degree of accuracy resulting. The pure sulphur was obtained by recrystallizing roll sulphur from benzene and complete drying.

CHECK TESTS.

(*a*) *Pure Sulphur alone.*

	(1)		(2)
Weight of sulphur taken	0·5000	..	0·5000
Weight of sulphur found by Davis and Foucar method	0·4992	..	0·4991

(*b*) *Effect on Sulphur of Heating to 100° with 95 p.ct. of Sulphuric Acid.*

In tests (1) and (2) the sulphur was heated with 15 cc. of acid for two and four hours respectively, and the residual sulphur extracted with CS_2, according to Marsden's method.

In tests (3) and (4) the heating was for two and four hours respectively; the residual sulphur washed, dried, and weighed.

	(1)	(2)	(3)	(4)
Sulphur taken	1·212	0·990	0·500	0·500
,, found	1·212	0·988	0·4995	0·499

(*c*) *Tests made by Sulphuric Acid Method with Mixtures of Known Amounts of Iron Oxide, Pure Sulphur, and Tarry Matter.*

	(1)	(2)	(3)
Taken—			
Iron oxide	1·237	1·020	0·999
Sulphur	1·012	1·042	1·018
Tarry matter	0·260	0·300	0·021
Found—			
Sulphur—			
By sulphuric acid method	1·006	1·0415	1·018
By Davis and Foucar modified method	1·005	1·043	—

(*d*) *Spent Oxide No. 1 (Low in Tarry Matter).*

	P.Ct.
Sulphur *plus* tarry matter, average of four tests	54·40
Sulphur, exclusive of tarry matter—	
By sulphuric acid (*b*)	54·05
By sulphuric acid (*c*), using benzene for extraction	53·95
By Davis and Foucar (*a*)	54·00

(*e*) *Spent Oxide No. 2 (Higher in Tarry Matter).*

Sulphur *plus* tarry matter, average of six tests	50·80
Sulphur, exclusive of tarry matter—	
By Davis and Foucar (*a*)	(1) 49·49
	(2) 49·49
By sulphuric acid (*b*)	(1) 49·45
	(2) 49·40
By sulphuric acid (*c*)	(1) 49·60
	(2) 49·55
	(3) 49·25
	(4) 49·45

All three methods described, therefore, are capable of giving determinations of the true percentage of free sulphur in spent oxide with a considerable degree of accuracy. The time required for the completion of an analysis is much the least when the removal of the tarry matter is effected by method (*c*)—*i.e.*, by the action of sulphuric acid on the carbon bisulphide solution. This is especially the case if no determination of the tarry matter in the extract is required, as then the solution obtained by the first extraction with carbon bisulphide can be treated at once with sulphuric acid without previously distilling off the solvent. In that case, the time required is but little more than that necessary for the old determination of the sulphur (including tarry matter) by simple extraction with the bisulphide. The modified Davis and Foucar method (*a*) and Marsden's sulphuric acid method (*b*), both require a decidedly longer time for completion than method (*c*). But the additional time is mainly taken up by the processes of extraction, digestion, or distillation, which proceed with practically no attention; so that the time actually given to the test by the operator is not materially increased. The preference of an individual analyst for one or other of the two last-named methods will probably be decided mainly in accordance with his general bias in favour of gravimetric or of volumetric methods.

Tarry Matter Extracted by Carbon Bisulphide.—The percentage of such tarry matter is found from the difference between the percentage of the total CS_2 extract and that of the sulphur free from tarry matter. It must be borne in mind that this figure is always smaller than the actual percentage of tar in the spent oxide itself, inasmuch as the free carbon in the latter is not extracted by carbon bisulphide, and is left in the residue, and, further, because some of the lower boiling constituents of the tar are distilled off with the carbon bisulphide.

Solvent for Extraction of Sulphur.—In place of the generally employed carbon bisulphide, benzene may be used, if the extraction of the spent oxide is carried out with the hot liquid in the Soxhlet apparatus for two hours, using 200 c.c. benzene for each gramme of sulphur extracted. The results are substantially the same as with carbon bisulphide, as seen in the figures for Spent Oxide No. 1 above, and with its lesser volatility and less unpleasant smell, benzene is much preferable to work with.

In a concluding article, the methods for the determination of the total ammonia and of the cyanogen compounds in spent oxide will be considered.

THE "SANDWICH" SYSTEM OF FUEL BLENDING.

By E. W. L. NICOL.

[IN forwarding the subjoined article, the author said it was an advance copy of an article on "Fuel Blending" which would appear in "The Times Engineering Supplement" on Friday, the 17th inst. The article describes the "Sandwich" system of solid-fuel blending, which should appeal to "JOURNAL" readers as a possible solution to both the coke and breeze problems, inasmuch as experience has shown that coke simply crushed to a uniform maximum size of about 1½ in. mesh, and containing all the breeze made in handling and crushing, is the most suitable material for blending with coal by means of this system. The extent to which the "Sandwich" system of fuel blending has been adopted by many important steam-users—notably the London County Council Trams Department, Liverpool, Cardiff, Bournemouth, and Deptford electricity supply authorities, among others—and the very gratifying results which have been reported and indicated by the receipt of repeat orders for more double-feed hoppers, augurs well for the future of coke and also for our "place in the sun" in the matter of national electricity supply.—ED. "G.J."]

> "It may be asked how it has happened that hitherto the smokeless combustion of fuel has not been effected. I answer: Because the chemistry of combustion has been neglected, not in the laboratory, but in practice; and because the construction of our furnaces has been too much left to those who know little of the chemical properties of the materials which are to be consumed in them."

WRITTEN over seventy-three years ago by C. Wye Williams, the pioneer in the movement to obtain more efficient use of coal in steam-boilers, these words are still largely applicable to the position as it is to-day. A survey of Patent Office records over a period of much less than seventy-three years indeed adequately refutes the charge of neglect; and thousands of patents have been granted for inventions relating directly or indirectly to improvements in boiler and furnace construction which aim chiefly at the efficient or smokeless combustion of bituminous coal. But notwithstanding these and the sustained efforts of many engineers and scientists, the average thermal efficiency of coal-fired steam-boilers, of all types and sizes, has quite recently been estimated by competent authorities at about 50 p.ct. Based so far as possible upon statements of fuel consumption and water evaporated, which have been submitted by steam-users to the Coal Controller, the official opinion is that "50 p.ct. boiler efficiency would certainly not be too low."

These figures not only show a deplorable state of inefficiency and waste on a colossal scale, but also tend to prove that the best possible adaptation of both furnace and steam-boiler construction to suit the complex composition and characteristics of our native coal fuels is largely impracticable.

Certainly, but for the efforts of many engineers and inventors, they would have been appreciably worse. In any case, however, failure to apply to all kinds of boilers conditions which will with ordinary skill ensure smokeless and efficient combustion may now be admitted. It must also be conceded that, for economic reasons, modern stoking apparatus is largely inapplicable to thousands of steam-boilers now in use. Still less available is the skill necessary for the intelligent use of modern indicating, recording, and stoking apparatus.

REMEDIES OLD AND NEW.

Since the advent of the present coal crisis, and the inception of State Control of Coal Mines, more than usual interest has been bestowed upon the working of steam-boilers and coal conservation. Various remedies have been suggested with the view to improvement; but, with one exception, expert investigation and scientific methods of control have so far been apparently the only lines upon which either private or official action has been taken. These measures are, of course, very desirable; and, so far as they have been applied and maintained, they have effected economies which will materially help the situation. These expedients must, however, in the light of past experience, be regarded not as a panacea but merely as palliatives, which require not less, but more, of the scientific knowledge and skill which is apparently not possessed by the average steam user. On the other hand, it is of the essence of good management not to complicate, but to eliminate, or render "fool-proof," so far as possible, operations or processes which must be entrusted to unskilled operatives. The efficient combustion of bituminous coal under steam-boilers is now acknowledged to be a thermo-chemical process of great complexity; but recent experience has proved that even this operation is amenable to treatment by a process of complete or partial elimination.

On many important steam plants the use of bituminous coal, with all its attendant inefficiency and waste, has now been entirely eliminated by the substitution of coke—the furnaces being suitably adapted. But before the formation of the London Coke Committee, some five years ago, the use of coke as fuel for steam-raising was limited to relatively small hand-fired steam plants. The adaptation of certain types of existing mechanical stokers to the use of coke or admixtures of coal and coke, has, however, proved to be a more difficult problem; but it may now be claimed that this has been satisfactorily accomplished. By means of a simple system of blending, introduced by the present writer, the use of bituminous coal as fuel for mechanical stoking is reduced to a minimum; while the relatively small proportion of coal so used is employed to better advantage than has hitherto been found possible under ordinary every-day conditions. The "Sandwich" system of blending and feeding fuel to steam-boiler furnaces, which incidentally permits a material increase in national wealth due to bye-product recovery, enjoys the distinction of having been accorded official encouragement by the Coal Mines Department of the Board of Trade. Readily applicable to existing mechanical stokers, it has already been adopted by many important steam-users, primarily as a temporary expedient, in order to maintain essential public services during the period of acute coal shortage. But extensive alterations to overhead storage bunkers, that have since been carried out with the view to facilitating fuel blending operations, would appear to indicate that many of the more important users have adopted the system as a permanent institution—not merely from patriotic considerations, but simply because it pays.

Certain definite factors have hitherto limited the range of fuels which could be utilized economically for steam-raising at electricity supply, tramway, and other power stations. The transport-economizing "zone" system of satisfying local demands from the nearest sources of fuel supply has in this country, as well as abroad, revealed many faults in power station design which have unnecessarily limited the range of fuels available. Almost invariably these stations have been laid out on the assumption that free-burning bituminous coal of uniform grade and quality would be the staple fuel to be used. Draught, mechanical coal-handling, storing, and stoking appliances are more or less inflexible; and no provision has been made for the systematic grading and blending of different kinds of fuel. In the light of present knowledge, and in view of the economies which accrue from the zone system of fuel distribution, such methods must be regarded as primitive. Except, perhaps for their crude simplicity, they have nothing to warrant their embodiment in new, or their continued use in existing, power stations.

ADVANTAGES OF BLENDING.

As far as the writer is aware, no attempt has hitherto been made to blend solid fuels having different physical and chemical characteristics with the view to improving the efficiency and intensity of combustion. Mainly with the object of complying with specified conditions as to calorific power, viscosity, flash point, &c., fuel oils and spirits are frequently blended by distillers and

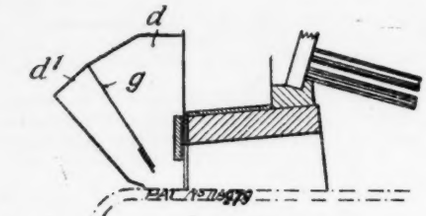


Fig 1

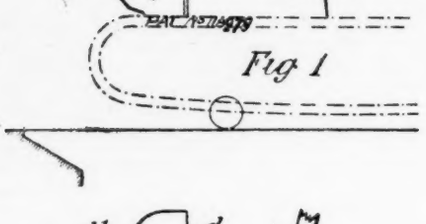


Fig. 2.

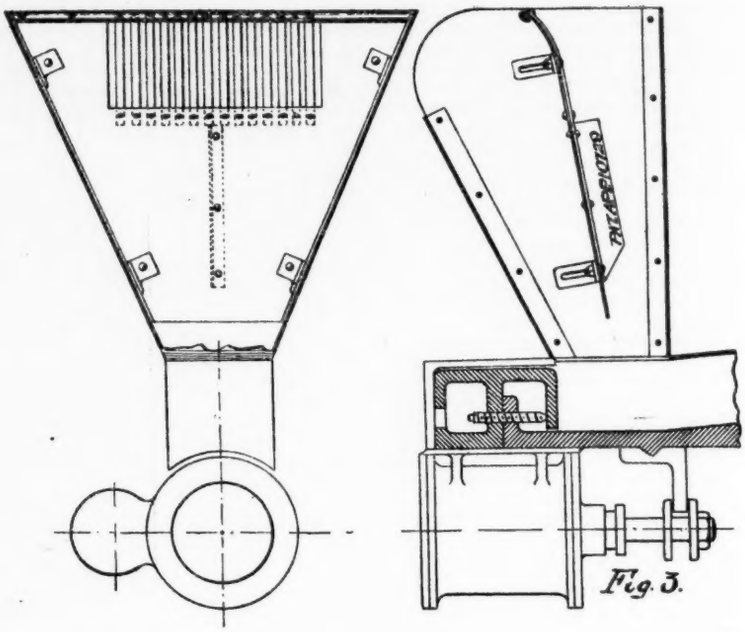


Fig. 3.

dealers. The blending of coal gas with carburetted or blue water gas so that the resultant admixture conforms to the statutory standard of calorific power, &c., is also a practice which has been brought within the region of an exact science by gas engineers; and the possibility of blending with the view to improve the efficiency of combustion of gaseous fuel is a subject that is now receiving close attention. Users of pulverized coal also recognize the advantages of blending high and low grade fuels, for specific purposes or for commercial considerations—a practice to which this system of combustion readily lends itself. For use in rotary cement kilns, for instance, a certain minimum of volatile combustible in the pulverized fuel is necessary in order to avoid risk of unburnt carbon finding its way into the cement material. With this knowledge, the large user, who is usually also a shrewd buyer, takes advantage of variations in prices; selecting fuels which for the time being are the most advantageous, and, having ascertained their proximate analyses, he proceeds to compound a mixture of two or more different kinds that will conform to his requirements at minimum cost. This is one of the advantages of the system which has very considerable commercial importance. But, apart from the larger consideration of coal conservation, it may be of interest to examine to what extent the ordinary power user may avail himself of the practical and financial advantages that accrue from the judicious blending of different kinds or grades of coal—bituminous, lignitic, or anthracitic, and peat, gas coke, cannel coke, or coke breeze—with a view to improve the thermal and commercial efficiency of his boiler plant.

Inherent Defects of Coal as Fuel.

Considered merely as fuel, the disadvantages of bituminous coal have been recognized from very early times; and that particular characteristic which the late Prof. Lewes aptly described as "the curse of coal"—*i.e.*, its low volatilizing temperature—is probably the root cause of the low average efficiencies realized in its direct use as fuel. It is, of course, well known that many of the rich hydrocarbons contained in it begin to distil-off at temperatures much below those necessary to effect their ignition and complete combustion, and are, therefore, largely wasted. But, incidentally, it is this very characteristic of coal which enables it, by the process of carbonization and bye-product recovery, to contribute so largely towards the national wealth.

In addition to the human element, the expression "boiler efficiency" includes at least three important factors—viz.: (1) The efficiency of the boiler itself, or its capacity for conveying heat to the water and steam inside; (2) "furnace efficiency," or its capacity for converting fuel into useful heat; and (3) "fuel efficiency," which may be described as its capacity for being converted from potential into useful heat energy. Beyond the maintenance of the plant in good condition, the first two factors are largely incapable of variation in most of the steam-boilers now in use; but the third factor, "fuel efficiency," has been proved capable of considerable variation. Obviously, all fuels, whether solid, liquid, or gaseous, are not equally efficient; and by blending, either before or at the point of ignition, variable results are obtainable. To judge by the various systems of buying and selling coal, gas, and other fuel, merely on the basis of its calorific power, as distinguished from its calorific intensity, the importance of the bearing of this factor upon the fuel cost of steam production and heating does not appear to have been fully appreciated.

In the "Electrical Review" so long ago as 1901, Mr. W. H. Booth, the well-known authority on combustion, advanced what was then a new theory of two-stage bituminous combustion in boiler furnaces. He showed that the furnace temperatures attainable in ordinary circumstances depended not so much upon the relative calorific power of coal as upon its composition. In a piece of coal, he argued, there exist solid carbon, solid hydrogen, and solid oxygen. It is well known how great is the amount of heat required to be taken from the so-called permanent gases in order to reduce them to the liquid form, and how it is still more difficult to render them solid; and the solid coal will only dissolve into combustible vapour at the expense of the heat in surrounding bodies, as ice dissolves to water or water to vapour at the expense of heat. In gas making, it obtains it from the fuel used in the retort or producer furnace; and this process of carbonization and gasification absorbs anything from 15 to 25 p.ct. of the heat available in the coal. In the steam-boiler furnace, it obtains it from the incandescent fuel on the grate. If the volatile parts of ordinary bituminous coal could be caused to escape entirely unburnt, Mr. Booth further showed, the net fuel efficiency might be as low as 25 p.ct., as the volatile hydrocarbons carry with them not merely their own calorific capacity, but also the latent heat absorbed by them in the process of distillation.

In ordinary circumstances, the volatile matter in a ton of coal in the process of combustion evolves 12,000 c.ft. or more of rich combustible gas; and no doubt the escape of large volumes of this gas unburnt, or only partially burnt, together with its latent heat, accounts largely for the waste which appears to be unavoidable in the use of bituminous coal as fuel. When dealing with non-bituminous fuel, such as coke, which is a "single-stage" fuel, experience has proved that efficient combustion and high calorific effect are much easier to secure than in the case of bituminous coal; and the theory advanced by Mr. Booth serves to explain this. Coal, coke, and gas are related to each other much as are ice, water, and steam. Judged by its analysis, coke should not have a calorific effect superior to that of coal, such as it possesses; but the explanation probably is that the process of combustion being already far advanced by the heat-absorbing process of carbonization, less heat is required to gasify it than is necessary in the case of coal. There is also a marked difference in the specific heats of coal and coke; and the latter, of course, burns without the formation of water.

Actual Working Results.

Some of the actual working results obtained at important power stations with mechanical stokers of the chain-grate type, using unscreened crushed coke or breeze as a diluent in proportions varying from about 30 to about 75 p.c., are now available. Those supplied by the London Hydraulic Power Company were obtained in the ordinary course of working at one of their hydraulic pumping stations where the "Sandwich" system of fuel blending has been in use for some time. According to the report of the Chief Engineer, the tests were made for the purpose of ascertaining the comparative efficiency when burning (1) coal slack and unscreened broken coke; and (2) coal only, under exactly similar conditions of natural draught, &c., on the same (Babcock & Wilcox) boiler and economizer. The normal guaranteed capacity of the boiler was 6000 lbs. per hour.

The usual methods of measuring the feed water by volume

were employed, and observations of feed water and flue gas temperatures were taken at fifteen-minute intervals. In test No. 1, the coal and coke were each weighed separately, and filled by hand into their respective feed hoppers on the chain grate stoker; the patent double hopper system of feeding adopted being substantially that shown in fig. 1. Here d^1 is the coke-feed hopper, and d that for the coal. Thus the composite feed enters the furnace in well-defined superposed layers; the coal being on top. The volatile gases given off from the latter maintain the fire-brick ignition or "coking" arch in an incandescent state; thus establishing positive and continuous ignition at the point of entry on the grate. With a simple and intimate admixture of coal and coke in any considerable proportion, it had been proved impossible to maintain these essential conditions, as the arch gradually cools and misfiring occurs. The report says: "The proportion of volatile matter was, approximately, 8 p.ct. below that of coal only. This would appear to constitute an important element in determining the thermal efficiency of the boiler, for the reason that the hydrocarbon loss is minimized, due to the reduction of the volatile matter in the combined fuel. The thermal efficiency obtained in test No. 1 was 80 p.ct., and in test. No. 2, with coal only, 61 p.ct.; showing a difference of 19 p.ct. in favour of the combined fuel." Other important data relating to these tests are as follows:

	Test No. 1. Coal and Coke.	Test No. 2. Coal Only.
Calorific value as fired	11,138 B.Th.U.	12,150 B.Th.U.
Fuel consumed per grate ft. hour .	30·66 lb.	31·66 lb.
Ash and clinker, actual	16·22 p.ct.	12·7 p.ct.
Average steam pressure	178 lb.	179 lb.
Average super heat temperature .	486° Fahr.	490° Fahr.
Water evaporated per hour . . .	10,505 lb.	8747 lb.
Water evaporated per hour per sq. ft. of heating surface . . .	5·22 lb.	4·35 lb.
Water evaporated per lb. of fuel as fired from feed temperature .	7·18 lb.	5·76 lb.
Water evaporated from and at 212° Fahr.	9·22 lb.	7·44 lb.
Efficiency; boiler and superheater	69·9 p.ct.	53·12 p.ct.
Efficiency; boiler with economizer	79·96 p.ct.	60·98 p.ct.
Draught over fire	·25 in.	·25 in.

In simply changing over from coal only to coal and coke the economies which accrue are far greater than those which can be calculated from known losses. In all probability the increased efficiency follows largely from the fact that the size and type of furnace and the disposition of the boiler heating surfaces relative to the fuel bed are better suited to the character of combustion and flame length obtained with the combined fuel. The necessity for using coal of a bituminous character at all arises out of the difficulty of securing, under ordinary conditions of natural draught, satisfactory and continuous ignition if coke is used alone. But it is gratifying to note the experiences of some power station engineers who, by means of the "Sandwich" system, are now using, with unscreened coke, very inferior coal slack from Somerset and other collieries (which is unsuitable for any other than direct fuel purposes), and are obtaining satisfactory results at high rates of combustion. These experiences suggest the possibility of utilizing as a "primer" for coke by means of this system such waste fuels as are now discarded in the pits, and also bituminous "duff" and washery slurry which are now regarded as so much waste material; and in the event of coal distillation schemes progressing as it is to be hoped they will do, surplus gas, creosote, pitch, or crude tar may become available for this purpose, while the supplies of coke would also be largely augmented.

Fig. 2 shows a modified arrangement of the "Sandwich" system designed to feed an additional layer of coal next to the grate, so that in burning non-bituminous or anthracitic coal the grate is protected from the intense local heating effect of such fuel.

Fig. 3 shows the system adapted for use with reciprocating ram type stokers, in which the feed ratio of coal to coke is more conveniently effected by a lateral, instead of vertical, movement of the diaphragm. In operation, the most effective ratio of coke to coal is determined by a process of trial and error; it is then necessary only to feed the coal and coke into their respective hoppers as required.

Percentage of Ash in Coke.—Writing to the "Iron and Coal Trades Review," Mr. John Hughes, F.I.C., draws attention to the great differences frequently shown in figures of ash reported by different analysts in respect of duplicate samples of coke, and suggests that these differences are probably chiefly due to the methods adopted in reducing the coke to fine powder. If the coke be ground into fine powder by means of an iron mill, or is pounded in an ordinary iron mortar with an iron pestle, the fine powder will be largely contaminated with metallic iron, the presence of which can be easily demonstrated by passing a magnet through the powder, when a perfect forest of iron particles will be seen adhering to the edges. If, however, the pieces of coke are placed in a strong linen bag and broken into fragments sufficiently small to be subsequently reduced to fine powder in an agate mortar, no appreciable extraneous iron particle will be found in the finely-prepared powder. From an actual experiment, he found that a sample of coke prepared by the first method contained as much as 4 p.ct. of ash; whereas, when prepared by the second method, the ash did not exceed 1 p.ct.

THE ACIDITY OF SULPHATE OF AMMONIA.

By JOHN T. SHEARD, of Sheffield.

THE experiments described by Mr. P. C. Gardiner in the last issue of the "JOURNAL," on the effect of washing sulphate of ammonia with water in order to reduce its acidity, are interesting and instructive, although perhaps they only make explicit what implicitly was well enough known before.

Advantage has been taken of the known facts which Mr. Gardiner's experiments further elucidate in endeavours to obtain a neutral salt by means of such washing; and a patent was granted a few years ago for a very elaborate and pretentious process wherein this method was employed. Unfortunately for the success of all such methods, it is not possible to wash the acid out of the crystals without at the same time partially dissolving them, and thereby causing considerable loss. In a process which the writer has recently introduced at the Neepsend works of the Sheffield Gas Company (and for which provisional patent protection has been granted) this obstacle has been overcome by means of a simple modification of the ordinary method of sulphate manufacture, whereby perfectly neutral salt is obtained at no extra cost.

It may be of interest to put on record here particulars of an experiment carried out a little while ago to show the behaviour of free acid in sulphate when exposed to the air, as regards its effect in preventing the drying of the salt and promoting the absorption of moisture from the atmosphere. The sulphate was exposed quite freely in the gas-works yard; and as, naturally, some dust collected on its surface, this was estimated at the termination of the experiment and allowed for.

Moisture at the Start, 3·50 *p.ct. Free acid*, 0·50 *p.ct.*

Duration of Exposure.	State of Weather.	Moisture Gained or Lost in Intervals between Weighings. Lost.	Gained.
Hours.		P.Ct.	P.Ct.
20	Dry.	2·50	—
44	Damp.	—	1·54
68	Dry.	0·83	—
90	Raining.	—	1·77
140	Do.	—	2·83
164	Damp.	1·90	—
188	Dry. Sunny.	2·28	—
210	Do.	1·16	—
234	Dry.	0·11	—
260	Do.	*Nil*	*Nil*
	Totals.	8·78 ..	6·14
		6·14	
	Net loss	2·64	
	Add for dust collected. .	0·59	
	Total loss of moisture . .	3·23	

Residual moisture in sulphate after exposure, 3·50 − 3·23 = ·27 p.ct.

Timing Device for Calorimetric Determinations.

Mr. Charles A. Myers, jun., describes in the "Journal of Industrial and Engineering Chemistry" a new electrical timing device for simplifying the thermometric reading of calorimetric determinations, where radiation factors are involved. One of the chief advantages of this timing device is said to be its absolute accuracy in giving the operator the exact second at which to read the thermometer. The instrument, moreover, relieves to a great extent the strain on the operator who may be called upon to make constant readings over an extended period of time. An audible warning signal is given five seconds before the time to read, and a second signal at the moment at which the reading should be taken. A further advantage is that almost any number of calorimeters may be operated at one time by this arrangement; it being simply necessary to have the signals loud enough to be heard by all the operators. The device consists of a clock with a large second-hand, making one complete revolution every minute. On the face are cemented four platinum-foil squares arranged so that contact will be made five seconds before the minute and half-minute, and again exactly on the minute and half-minute. Contact is made by a fine platinum wire soldered to the second-hand of the clock. Two buzzers are used to give the signals—one of high pitch, the other low. As these consume a relatively large amount of current, it is impossible to make contact for them directly through the platinum wire; and the contacts really operate two relays, and these in turn pass the current through the buzzers. The relays are made from common nails about 1½ in. long, turned down in a lathe, and wound with covered copper wire. A small piece of platinum is soldered to the end of one of the magnets of each relay; and this makes contact with another piece of platinum soldered to the armature—thus closing the circuit to the proper buzzer. The relay magnets and their supports are mounted on a hard rubber base. A double switch is provided to cut out the half-minute readings when these are not desired, and a single-point switch to shut off all readings.

CENTRIFUGAL FANS AND THEIR APPLICATION TO GAS ENGINEERING PRACTICE.

By FRANK S. TOWNEND, B.Sc., Eng., of Nechells, Birmingham.

[Abstract of a Paper which was read, accompanied by Lantern Slides, at a Meeting of the Midland Junior Gas Association last Thursday.]

The present paper is divided into four sections:

(*a*) An elementary theory of the fan—necessarily brief.
(*b*) A description of two types of centrifugal fan—the radial flow and the mixed flow.
(*c*) A discussion of the efficiency of the fan, methods of driving, and their regulation.
(*d*) A description of concrete examples of the latest practice in the application of fan plants.

An increase of pressure of a gas is the result of doing work on the gas either mechanically or by adding its heat equivalent. The mechanical doing of work may be carried out by direct compression, as in the reciprocating compressor, or it may result in an increased momentum of the gas particles. This latter forms the basis of the action of the centrifugal and axial fans. To consider briefly this principle, turn to fig. 1. *Ac* shows the section of a fan-blade, inlet and outlet tips at a radius of *r* and R from the shaft; and the speed of rotation is ω radians per second. The velocity of the tips of the blade at inlet $= v$ and at outlet $= v_1$. At the inlet, the gas moves towards the blade in a direction *bc*.

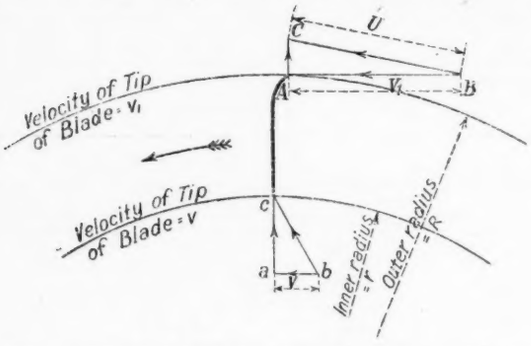


FIG. 1.—VELOCITIES OF GAS PARTICLES AT INLET AND OUTLET OF BLADE.

This may be looked upon as being composed of a velocity radially *ac* and a velocity tangentially *ba*. The angular momentum at point *c* is $\frac{Vr}{g}$ ($g = 32{\cdot}2$ ft. per second per second) per lb. of flow.

At the outlet, in a similar manner, the velocity of the gas leaving the blade is BC, composed of a velocity radially of AC and a tangential velocity of BA. The angular momentum of the gas at the outlet is $\frac{V_1R}{g}$. The rate of change of momentum or torque, therefore, is $\frac{V_1R}{g} - \frac{Vr}{g}$ and the work done is $\omega\left(\frac{V_1R}{g} - \frac{Vr}{g}\right)$ ft. lbs. per sec., which reduces to $\frac{V_1v_1}{g} - \frac{Vv}{g}$ the fundamental equations for turbines, fans, &c. The work done, however, on 1 lb. of gas per sec., raising its pressure through H ft. head = H × 1 ft. lbs. per sec.—that is

$$H = \frac{V_1v_1}{g} - \frac{Vv}{g}$$

The value of v_1 is greater than v, and depends on the speed and the outside radius R. In general V_1 is greater than V; and their values depend on the angles formed by the blade at the outlet and inlet circumferences respectively, which may have any desired value. The factors which control the difference in head given by any fan are:

(1) Speed of rotation.
(2) The outlet radius R and the ratio $\frac{R}{r}$
(3) The angles with the inlet and outlet circumferences formed by the blade at the tips.

The shape of the blades between the outlet and inlet, provided the curvature is smooth, has no effect. It will be noticed that the velocity of the gas at the outlet is very high; and if means were not taken to reduce this to the normal velocity of flow of the gas in the outlet main gradually, loss of head due to eddying would occur. This reduction in velocity is effected by means of the vortex chamber, where the area inside the casing gradually increases to the outlet main; so that if u_a is the normal velocity of the gas in the outlet main, U the velocity of the gas leaving the fan, the extra head gained by the vortex chamber is—

$$h = \frac{U^2}{2g} - \frac{u_a^2}{2g}.$$

This gives the merest outlines of fan theory; and consideration of the bearing of fan design on efficiency must be left.

The simplest type of fan based on the above-mentioned theory is—a radial flow fan for supplying the air-blast to water-gas machines. The shaft carries a "spider," consisting of six T iron arms, to each of which is fastened a sheet-iron paddle, the sides of which are riveted to annular discs. The direction of the paddle at the inlet is radial, but at the outer tip is curved backwards, making an angle of 50°. The sides of the fan wheel have $\frac{3}{16}$-in. clearance from the casing. It will be seen that the vortex chamber is obtained by setting the wheel eccentrically to the casing. The distance between the outer tip of the wheel and the casing varies from 3 in. at the beak to 12 in. at the outlet. The maximum efficiency of such a fan runs from 60 to 75 p.ct.; and it is particularly suitable for supplying widely varying volumes of air. Losses are generally high, owing to eddying at the inlet of the wheel, and to leakage along the casing from high to low pressure.

THE MIXED FLOW FAN.

In adapting the centrifugal principle to closed gaseous systems dealing with large volumes, and working to a pressure of sometimes 60 to 70 in., the mixed-flow fan has been widely developed. One well-known example (fig. 2) is that designed by Prof. Rateau. The flow of gas at the inlet is axial, and at delivery is radial. The impeller consists of a cast-steel conical boss, mounted

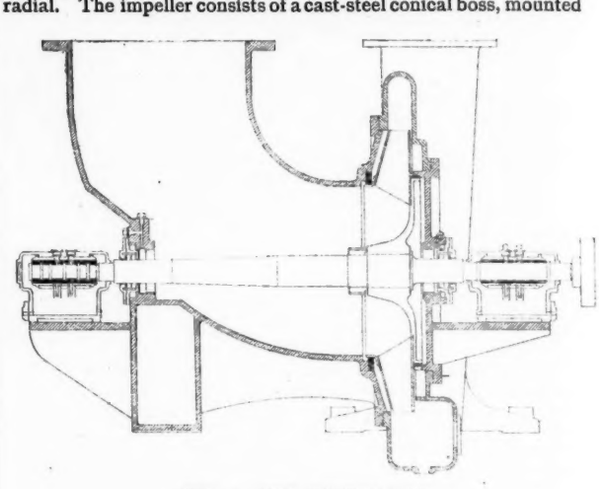


FIG. 2.—THE RATEAU FAN.

on a strong shaft. At the outer circumference of the boss are rivetted sheet steel blades of intricate design. There are 20 to 24 blades, with an outer-tip angle of 45°, being bent away from the direction of rotation of the wheel. The vortex chamber is of rectangular cross section, and is very carefully designed to give a high efficiency. The outlet is formed into a conical funnel. Leakage on the outside of the impeller is prevented by carbon rings. The bearings are of substantial high-speed design with ring lubrication; that at the inlet end having thrust collars to take the unbalanced thrust. The efficiency of these fans varies, as shown in the next section, and may reach a maximum of 90 p.ct.

This high efficiency is due to reduction of loss at the inlet, and the high recovery of the kinetic energy of the discharge as pressure head by means of the vortex chamber. The maximum head which has been obtained by a single impeller is about 80 in.

Theoretically, given a high enough speed, there is no limit to the maximum pressure difference to be obtained by a single-stage impeller. However, the tensile stresses induced in the material of the impeller must not exceed the safe working stress of the material. The velocity of rotation of the tip of the blade is thus limited. Again, leakage from high to low pressure is proportional at least to the pressure difference.

These reasons, and the unwieldy dimensions of a fan designed to pass large volumes against high heads, have led to the introduction of the multi-stage fan. A number of impellers are threaded on a single shaft, each impeller being designed to throw a moderate pressure difference—say, 25 to 30 in. The gas passes through the impellers in series, and thus reaches its final pressure by a number of equal stages of increment. These multi-stage fans are exceedingly compact and efficient machines, and may be designed to give almost any outlet pressure.

APPLICATIONS.

Before considering specific installations of gas fan plants, it is necessary to state the peculiar characteristics of the fan itself, and to see how these are affected by the methods of driving and regulation. Fig. 3 gives the curves of performance of a Rateau mine fan of 4·59 ft. dia. impeller. Our fundamental equation in the first section of the paper shows that the head is proportional to the square of the velocity. Hence the head curve will also be a (velocity)^2 curve—*i.e.*, the velocity curve would have an optimum in the same place. Again, since the efficiency curve has an optimum at practically the same value of discharge, it will be seen that a fan works best under constant conditions of velocity and discharge. The dotted line indicates the pressure thrown if the speed of the fan is kept constant throughout the range of the discharges; the head being practically constant. The two methods

of control of discharge are, first, constant velocity of the fan, with a gas-governor to give the constant pressure or vacuum on the outlet or inlet; secondly, the speed of the fan is raised or lowered to keep the conditions of pressure or vacuum as required.

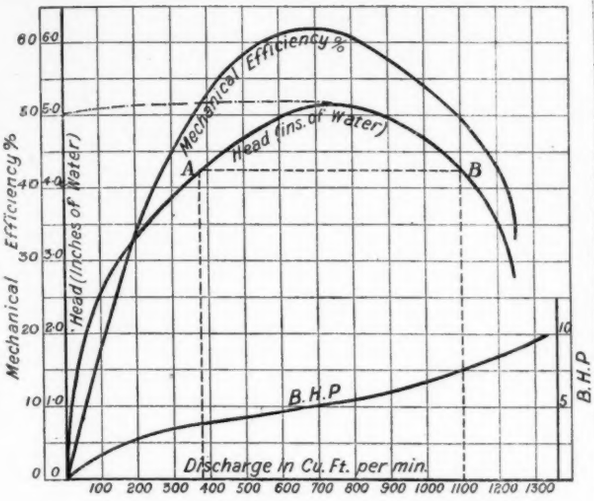

Mechanical Efficiency %
Head (Inches of Water)
Mechanical Efficiency %
Head (ins. of Water)
A
B
B.H.P
B.H.P
Discharge in Cu. Ft. per min.
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
0 10 20 30 40 50 60
0 1·0 2·0 3·0 4·0 5·0 6·0
0 5 10

FIG. 3.—CHARACTERISTIC CURVES OF PERFORMANCE.

Continuous lines relate to variable speed.
The dot-and-dash line is the head curve when the speed is kept constant.

Whichever method is adopted determines to some extent the drive used. Since the higher the velocity of the outlet tip of the blade the less the diameter of the wheel for any given head, high speeds are preferable. Electric-motor and steam-turbine drives direct coupled, therefore, are usual—the former worked as a constant velocity machine, the latter either constant velocity or controlled by a steam throttle-valve on the steam-chest. Examples of these will be shown later. Reciprocating steam-engines and gas-engines need speed-increasing devices, either gear or belt. In remote districts, where electricity is not available, the gas-engine must be used.

GOVERNING.

In all cases in gas engineering, either the outlet or inlet pressure must be controlled, and in certain instances controlled finely. Considering first the case when the speed of the fan is altered to effect this, it will be seen that (referring to fig. 3) for every head excepting the maximum there are two values of the discharge, as at A and B, where the head being 4·25 in. the discharge may be 370 or 1100 c.ft. per min., actually the discharge would oscillate rapidly between the two. Moreover, when the fan is driven by a turbine, there is a minimum speed lower than which it is not safe to run the shaft. Therefore, while theoretically it is the most economical method of running a fan plant to govern on the steam, yet in practice, when working at discharges that are much below nominal, it is necessary to work with a bye-pass open, thus bringing the discharges within the region of the apex of the curves—the surplus gas then being returned to the inlet of the fan. This, of course, means a larger consumption of power. Otherwise, throttle control seems to be satisfactory. The increase in power used when working the fan at its most efficient speed and passing the surplus gas back to the inlet through a bye-pass is shown on the slide. From the start to A the fan is passing just the district load; the average watts consumed being 2·5. At A, the bye-pass is opened, the fan now working at a more efficient speed and discharge; the wattage being nearly double. When the bye-pass is closed, the power consumed returns to practically the former load.

The fan may be utilized, then, wherever a volume of gas is to pass from one pressure to a higher. Fig. 4 indicates the pressures found in a gas system from the retort to the consumer's burner. If high makes of gas are to be obtained, they must be made under level-gauge conditions. The gas is delivered at the burner against atmospheric pressure; hence the need for mechanical propulsion. Normally, this is concentrated in the works exhauster, which draws the gas from the retort-house and delivers it into the holders.

The minimum pressure on the works is that of the holder when fully extended, which, *plus* the pressure thrown by the plant, is the outlet pressure on the exhauster. However, where the purifiers are of the water-lute type, the pressure at the inlet to the purifiers must not exceed what the blow-pot is set at. In the case in question, the maximum inlet purifier pressure permissible is 27½ in. Owing to increased plant on the purifier outlet, and to increased make—both due to war requirements—this had on several occasions been exceeded. During the summer of 1916 the whole question was investigated, and it was anticipated that for the six winter months pressures were likely to range as shown by the black line—giving an excess of 2½ in. above blowing point. It was decided to reduce the pressure at the inlet of the meters to ½ in. This reduces the pressures throughout the plant by the holder pressure *plus* meter pressure.

PRESSURE-REDUCING PLANT "B."

The plant consists in duplicate of a Rateau fan capable of passing 700,000 c.ft. of gas against a head of 15 in. The fan is shown in fig. 2. It is driven by a Curtis steam-turbine of 70 H.P., at a speed of 1750 R.P.M. The speed is kept constant by a powerful steam-governor. The lay-out of the plant is shown in fig. 5. A gas-pressure governor of the diaphragm type is provided on the inlet, which may be balanced to give any desired pressure. The top of the diaphragm is open to the atmosphere. An automatic bye-pass governor very similar to the pressure governor is fixed between the inlet and outlet mains. The top side of the diaphragm is connected by a pipe to the inlet main. If for any reason—such as the failing of the turbine or fan—the outlet pressure backs through the fan and raises the inlet pressure to (say) 5 in., the valve automatically opens and allows full-way for the gas. Of course, were this not provided, there would be a gas-way through the fan; but as the area of the outer perimeter of the wheel is less than that of the inlet main, throttling would occur, causing the pressure to rise unnecessarily throughout the whole plant.

TURBO EXHAUSTING PLANT.

This was built to pass 650,000 c.ft. per hour, against a head of 60 in. water-gauge. It consists of a two-stage B.T.H. gas-fan; the impellers being situated back to back. No vortex chamber is provided. The bearings are water cooled, and are ring lubricated. The centrifugal whirling acts as a tar-separator, and considerable condensate of light tar is obtained from the drain. It is direct-coupled to a two-stage Curtis 200 H.P. turbine, working at a speed of 3000 R.P.M. The speed of the turbine is controlled by a three-ported circular throttle-valve on the top of the steam-chest, which is moved by a Waller governor of improved type. The pull is transmitted from the retort-house foul main by a 3-in. vacuum pipe. It may be mentioned, in passing, that the combination of turbine and fan constitutes a reversed system. The pressure energy of the steam is converted into kinetic energy of rotation by the turbine, while this rotational energy in the fan is converted into pressure energy of the gas.

Fan installations are used for boosting from light holders on the works to heavier holders some distance away.

A DISTRIBUTION EXAMPLE.

The problem of how to supply adequate pressure to a residential district lying beyond a populous manufacturing area is a source of trouble in all large cities. The system of reinforcing the low-pressure supply by the introduction at selected points of auxiliary supplies of high-pressure gas, as developed in Birmingham, was described by Mr. J. Hewett in 1912.* In the instance under consideration, the supply to a rapidly growing residential suburb first passed through, and provided the supply of, an industrial district where the power and heating load was being continually augmented. As a temporary measure, the improvement in pressure was obtained by installing a fan plant some two miles from the nearest works. The fan is capable of passing 150,000 c.ft.

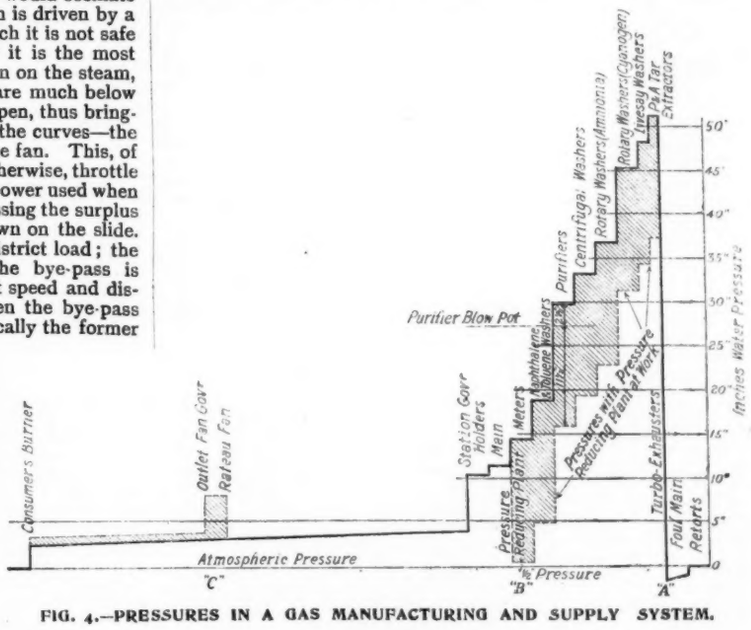


FIG. 4.—PRESSURES IN A GAS MANUFACTURING AND SUPPLY SYSTEM.

* See "JOURNAL," Vol. CXVII., p. 292.

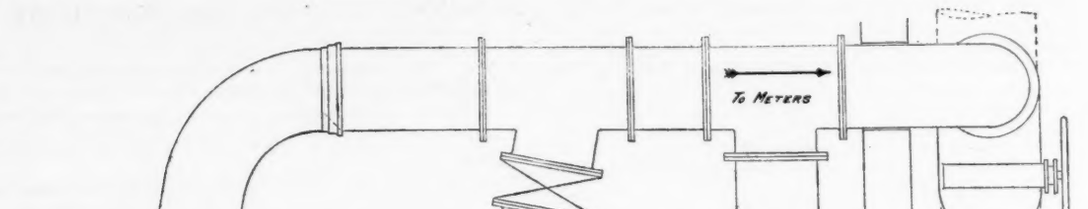


FIG. 5.—PRESSURE REDUCING PLANT.

of gas per hour against a head of 4 in. It is of the Rateau type, and is driven direct by a three-phase induction motor of 5 B.H.P., working at 400 volts and 1500 to 1420 R.P.M. The lay-out of the connections is on similar lines to the pressure reducing plant previously described. The gas-pressure governor is, however, on the outlet of the fan. A safety automatic bye-pass is provided.

It is to be noticed that the present expedient is not to be recommended as a permanency, as it does not at all relieve the main from the works to the inlet fan. In order to obtain the necessary gas to cope with the increased consumption at the higher pressure, it increases the velocity of the gas between the works and the booster.

CONCLUSION.

In conclusion, the following may be a concise statement of the position of the fan as a gas engineering device. For large volumes against fairly high heads, it is the most compact and efficient of mechanical gas propellers. It is reliable, with a low repair bill. Its high speed enables it to be direct-coupled to the most efficient power units—the steam turbine and the electric motor. Its chief disadvantage is that it will not take overload to the extent that a positive blower will; and its efficiency does not remain at the maximum over a very wide range of discharges.

DISCUSSION.

The PRESIDENT (Mr. T. H. Poulson, of Stafford) said they had had an excellent paper; and he hoped there would be a good discussion.

Mr. G. C. PEARSON (Birmingham), proposing a hearty vote of thanks to the author, remarked that the paper would be the first of its kind to appear in their "Transactions." He himself had had some little experience of exhausters of the type the author had been describing—two stage, not single stage; and there was no doubt that they represented a very big advance on the part of this branch of the industry. Considering ground space alone, they took up something like one-tenth of the room; and the exhausting was done in a much smoother and better form. At the works on which he was engaged, they had been able entirely to dispense with retort-house governors. As compared with the old type of exhauster that was in use at these works, it was found, under the conditions of working there, that the saving in oil alone was sufficient to justify the change. In regard to the question of governing, Mr. Townend said he considered that an exhauster of the fan type, coupled with retort-house governors, would make an ideal system for a works. He (the speaker) quite agreed that there was a lot to commend it. Really, it seemed to him that governing in the gas industry was absolutely in its infancy; and that now that they had arrived at the possibility of a lower grade of gas being sent out, when it would be essential that the quality should be constant, to keep the inerts down to the lowest practicable limit, they would find that none of the systems of governing in vogue at present would be adequate. They had to consider that each retort was in itself a separate gas-making unit. It was the usual plan to have a retort-house governor to govern a large part, or the whole, of the gas which was being made at one particular works; but this, he thought, would be found to be nothing like sufficient to keep the inerts down to (say) a total of 10 p.ct. The pull there was on a retort depended upon the rate at which gas was being made from the retort at the moment; and retorts—whether intermittent or continuous verticals—were constantly varying in the gas they were giving off, and the pull varied considerably in accordance with the make. How this difficulty was to be got over, was a matter for future consideration; but there was no doubt that the type of exhauster to which the paper referred, with its steady running, was going to be a great help. Furthermore, these exhausters were very useful on a works where it was necessary from time to time to shut-down.

Mr. C. F. W. RENDLE (Redditch) remarked that one thing which would no doubt have been of some use to gas engineers was a comparison of the merits of a fan of this type and those of a positive blower as an alternative means of achieving the same object in water-gas manufacture. He quite appreciated what had been said with regard to the application of fans of this type as a means of exhausting. It was a great point in their favour that they were capable of such a wide range of volume.

Mr. C. B. DONKIN (of the Bryan Donkin Company, Ltd.), on being asked by the President to speak, said he thanked the Association for their invitation to him and to the firm's Technical Engineer (Mr. Hopkinson) to be present. The paper touched on most of the points in connection with fans and turbo-exhausters; and there was not much that he could say about it. In the paper, it was stated that the maximum head which had been obtained by a single impeller was about 80 in. He did not know whether this figure was taken from a text-book; but he (the speaker) had never obtained anything like that. From 35 to 40 in. was the maximum for a single impeller. The revolutions necessary per minute to obtain 80 in. would be too many for the material to stand. As to governing the turbo-exhauster down to small volumes, by throttling the exhauster itself by means of the inlet or outlet valve it was possible to reduce the volume to anything or nothing at all, and still keep the pull constant.

Mr. P. HOPKINSON also pointed out that the speed represented by 80 in. head with a single impeller was not a practicable one.

Mr. TOWNEND said he accepted the correction.

Mr. T. F. E. RHEAD (Birmingham) said he quite realized the difficulty of treating the subject of fans in a popular manner. Mr. Townend said one did not take any account of the compression; and then he stated that one could produce pressures up to 60 in. of water, which was equal to about one-sixth atmosphere. He would have thought one would have needed to take this into account.

Mr. TOWNEND: For purposes of design, I think they do not take any notice of compression.

Mr. HOPKINSON: The quantity specified that an exhauster will pass is usually the quantity of free gas or air at the inlet of the exhauster. Over 5 lbs., we take it into account.

Mr. E. B. TOMLINSON (Birmingham) remarked that, on looking through the paper, many of them would probably have said to themselves, "Why should an engineer add to his machinery, if it is at all avoidable?" When they thought of having an exhauster to perform its ordinary functions, and then put in a pressure reducer owing to the increased pressure, they would exclaim, "Surely there is some other way of getting over the difficulty." He would like to say that the boosters at Nechells which had been illustrated were put in under war conditions. The ordinary way would have been to increase the depth of the lutes of the purifiers, or add to the plant. He did not wish to stand as an engineer in favour of adding to one's working parts; but the war came along, and they had to do what they could. The subject of governing was of first-rate importance, and one that needed a great deal of attention. In connection with the two-stage exhauster, steam governing was spoken of; and then, in the latter part of the paper, he thought Mr. Townend expressed the opinion that they could possibly do just as well by running the turbo-exhauster at a given speed, and reducing by a pressure-regulator. Whether it was quite so economical from a steam consumption point of view, was just a question. From all the data available, the steam consumption of the ordinary turbo-exhauster was a good deal less per million c.ft. dealt with under the same pressures than with the old reciprocating exhausters. It was not only on the smooth running side that they got an advantage, but also on economy of fuel. He appreciated the

trouble that Mr. Townend had taken, and thanked him very much for his paper.

Mr. E. W. SMITH, D.Sc. (Birmingham) said it occurred to him that Mr. Townend had displayed some courage in discussing the "black sheep" of the industry, because if anything had been at the bottom of the troubles they had got into during the last few years, surely the exhauster should have the blame. [Laughter.] Personally, he did not know much about exhausters; and he thought, perhaps, the most important point to him that had been brought out in connection with the paper was that mentioned by Mr. Pearson, when referring particularly to the operation of vertical retorts and to the possibilities of much variation in the gas coming off, in connection with the importance of proper governing and exhausting at the retort. It seemed to him that no occasion such as this, at the present time, should pass without the subject of the quality of gas supply being fully ventilated—as far as it was possible to be ventilated in the restricted time at disposal. As they all knew, the standard had been reduced during the war to 450 B.Th.U. gross, under Government conditions. It used to be 500 B.Th.U. gross; and when they were under an illuminating power standard, it was very much higher than this. He was not arguing for a minute that there should not be a considerable reduction from old conditions of calorific value. What he did deprecate was that the reduction should be made in ignorance of what the effect would be. Of course, they had Research Committees sitting on the subject of the best gas, and believed also on the most efficient gas to make at the works; but there was not enough discussion in the Technical Press on the subject of quality, and the requirements of quality. He thought the whole industry desired that the Board of Trade should not go back to a higher quality than 450 B.Th.U. Supposing this was agreed to, and the Board of Trade left it at that, there were a good many gas undertakings that would immediately, though they might have been providing a higher quality, feel the correct quality for them to make was 450 B.Th.U., or something slightly more. It was only to be expected; but it would be found, he felt sure, that gas undertakings using different coals would discover that there was a difference in the actual standards which they would have to adopt in order to secure the most efficient return for their particular works. To his mind, subject to this quality being kept as constant as possible, with new types of exhausters and other means, it did not seem advisable to endeavour to reduce the quality. If they had accepted 450 B.Th.U., what did it mean? Did it mean that works having horizontal retorts, and nothing else, whatever condition they were in, were justified ever in turning out gas of anything approaching 450 B.Th.U? There might be very, very few exceptions where the coals were such that, however efficiently they worked, the quality could not be got much over 500 B.Th.U., But he doubted very much if there was a single gas-works having horizontal or inclined retorts where it was possible to get down lower than 500 B.Th.U. gross under efficient working conditions from normal coals. Consequently, to turn out gas of less than this power, it was necessary to mix it with blue water gas or to admit air, or to over-pull at the retort (which immediately reduced the efficiency of the works. So that the only option, apart from blue water gas, was to admit air. If air was admitted, it meant that the inerts went up. On the question of inerts, he was satisfied that when the war conditions were over, and retort installations were got back into their normal working state (he did not mean all of them being made new), it should be possible to turn out gas efficiently with a maximum of 15 p.ct. of inerts—nitrogen and CO_2. The question might be asked, "Why have any restriction at all on inerts?" He did not believe it was any more justifiable for them to put into gas unnecessarily any air, than for a grocer to put sand into his sugar. Some people might say, "You only keep down inerts because of flame-temperature." They had only to make the calculations necessary, in order to realize that the question of flame-temperature was very little affected within very wide limits by inerts. Taking 100 volumes of gas containing 10 volumes of nitrogen, this would, before completing combustion, have to be mixed with about 600 volumes of air containing 500 volumes of nitrogen; so that the total nitrogen in the mixture was 510 volumes. As affecting flame-temperature, an increase from (say) 510 to 515 volumes of nitrogen was not important. The important thing was that an increase in inerts meant a serious increase in the specific gravity of the gas, which reduced the amount passing through an orifice, and caused lighting-back to occur. He felt very strongly on this subject, and wanted to encourage discussion on a matter which was more vital to the industry than any other.

Mr. PEARSON remarked that it was not possible to make a gas with any quantity of inerts, and at the same time maintain a constant quality; and that was the essential thing.

Mr. SMITH replied that he intended it to be taken for granted that the very pulling-in of inerts meant that one could not maintain the reasonably constant quality which was demanded.

Mr. H. R. LAMB (Birmingham), referring to the power consumption in the two installations mentioned in the paper, pointed out that where the booster handled the full volume and bye-passes the surplus, the machine was running on full power consumption throughout; but where the booster only handled the volume delivered on the district the saving was considerable, as the power consumption varied approximately as the volume handled.

Mr. V. E. GREEN (Birmingham) hoped that improvements might soon be expected in fan construction by the use of new alloys, brought more to notice during the war, which were capable of withstanding much greater tensile stresses. He stated that there was no reason why speeds should not be increased to cause stresses double those now considered safe, by the use of special heat-treated steels.

The PRESIDENT closing the discussion, asked Mr. Townend to accept the vote of thanks for his paper, which was warmly accorded.

Mr. TOWNEND, after replying to the vote of thanks, expressed his pleasure at the interesting discussion to which his paper had led, and replied briefly to two or three of the points raised.

At a meeting of the Illuminating Engineering Society, to be held at the Society of Arts this (Tuesday) evening, Mr. A. Wise will open a discussion on "Modern Practice in Office Lighting."

YORKSHIRE JUNIOR GAS ASSOCIATION.

An Informal Meeting of the Association was held on Saturday last at the Bradford Gas Department Show-Rooms, when various points raised by the President (Mr. E. L. Oughton, of Longwood), in his address to the members at the last meeting, came under discussion.

The chair was occupied by Mr. GEORGE DOUGILL (Heckmondwike), Vice-President; and though the attendance was not very large, most of those present took advantage of the absence of Press representatives to make some remarks. The effect of present-day gas upon meters was, perhaps, the best discussed topic; and the interest evolved kept the members together long past the usual breaking-up hour.

Mr. E. A. LEASK (Leeds) proposed, and Mr. P. M'NAB (Low Moor) seconded, a vote of thanks to Mr. Oughton for the ready way in which he dealt with the discussion of his address; and a brief response by the PRESIDENT brought an instructive meeting to a close.

DUTCH ASSOCIATION OF GAS ENGINEERS.

Annual General Meeting.

(*Continued from p.* 73.)

THE TESTING OF COAL TAR.

Dr. F. van Oostrom Meyjes's paper was a criticism of the methods of testing coal tar embodied in the general conditions of sale of coal tar issued by the Dutch Government Coal Distribution Department. In regard to free carbon, the specified test is, briefly, to warm on a water-bath about 5 grams of the tar with five times its weight of benzol, then filter through a weighed hard dry filter, wash at least three times with hot benzol, dry the filter and contents two hours in a water-oven, and weigh. The author had found that washing even ten times with hot benzol, instead of only three times, did not really afford a constant weight—it was necessary to repeat the washing until the benzol passed through the filter colourless. Moreover, two hours' drying in a water-oven was insufficient; loss of weight went on for much longer, and, to be safe, the drying should be continued until the filter was quite odourless. The weighing of the filter containing the free carbon should be done in a weighing tube or pair of watch glasses, after cooling in a desiccator. If exposed to the air for half-an-hour, and weighed in an open watch glass, a considerably higher weighing was obtained. Different analysts, conscientiously following the Department's prescriptions, could find widely different results for the free carbon in the same sample of tar. The prescribed method of determining the water in tar—viz., by distillation to 170° C.—was satisfactory, provided the sample examined was representative of the bulk. No directions were given for sampling; and with crude tar enormous differences might arise through different modes of sampling. The author quoted numerous examples of tests of different samples in illustration of this point, and of the effect on the price paid for the tar after deduction of the quantity of water found by the tests. He suggested, in conclusion, that either the tar should be sold (as formerly) without analysis, at a fixed price, or that entirely new testing prescriptions should be introduced, with instructions for proper sampling, which would not have the effect of penalizing the gas undertakings.

The Chairman thanked the author for bringing up the matter, and promised that the Coal Committee would at their next meeting set about the formulation of acceptable regulations for the sampling and testing of tar.

USE OF LIGNITE IN GAS MANUFACTURE.

A discussion on the use of lignite and poor coals in the gas industry was opened by Heer M. Levert, of Apeldoorn. The topic was selected for discussion because the Dutch gas-works had, for some months before the meeting, been forced, through lack of adequate supplies of gas coal, to carbonize bituminous smalls, lignite, and poor coal smalls in order to maintain even a restricted supply of gas. Heer Levert said that at the previous year's meeting it was suggested that a mixture suitable for carbonizing was 65 p.ct. of bituminous coal, 13 p.ct. of lignite, and 22 p.ct. of poor coal. He had tried such a mixture with bad results, especially in regard to the quality of the coke, which, moreover, would not maintain the heats in the settings. If, however, the lignite were left out of the mixture, good coke was obtained; and even a mixture of 70 p.ct. of bituminous coal with 30 p.ct. of lignite answered satisfactorily.

Heer W. P. Peeters reported the results of carbonizing at the small gas-works of Oudenbosch mixtures in varying proportions of bituminous coal, German coal, poor coal, and lignite. He found that lignite, which to all appearances was quite dry, contained 20 p.ct. of water. The bituminous coal, although rich in ash, gave a hard coke when mixed with as much as 25 to 30 p.ct. of lignite or poor coal, provided high heats were used.

Heer E. E. van Rhijn (Hoorn) said that he agreed with Heer Levert that a mixture of bituminous and poor coal and lignite was not serviceable; and in order to make use of the lignite supplied to his works, he had carbonized it apart from the coal.

He questioned the policy adopted by the State Coal Distribution Department, according to which gas-works which had water gas plant were not obliged to take any lignite as part of their coal supply. It was an incentive to the smaller gas-works to introduce small primitive water gas plants, such as were already largely used in Germany.

Heer J. Ph. Bruinwold Rielel (Utrecht) said that gas-works which added 25 p.ct. of blue water gas to their coal gas were not required to carbonize any lignite, because the lignite gas, in addition to the water gas, would yield a mixed gas of too low calorific power. The concession applied only to works which already had water-gas plant.

Heer Th. Ferkranus (Dokkum) referred to the difficulties attendant on the use of lignite in small works, and pointed out that while lignite cost only 10s. to 12s. a ton, to works in the North of Holland the freight and auxiliary charges ran up to 150 p.ct. of the cost of the coal. He suggested that a uniform railway rate for lignite to all parts of Holland should be granted.

The Chairman said that this question had been raised at the last meeting of the Central Transport Board, and was still under consideration; but it was really part of a broad issue of freight regulation.

Heer P. Bolsius, of Bois-le-Duc, said that his retorts were served by a coal conveyor and elevator; and while he could get on with as much as 35 p.ct. of lignite, his make of gas fell enormously, and the heats dropped as soon as he used any appreciable quantity of poor coal also. The most he could use of poor coal was 7 p.ct., and this was not enough to be of any real service. With his plant, it was practically impossible to mix such a small proportion regularly with the other coal. It would be better that the poor coal smalls should be omitted from the coal ration of works equipped like Bois-le-Duc.

Heer J. W. H. Bauduin (Maastricht) said that his works were equipped with large carbonizing chambers; and when a mixture of 70 p.ct. of bituminous coal with 30 p.ct. of lignite was carbonized, it was necessary to leave the charge in for 48 hours, instead of the customary 24 hours. This entailed a consumption of coke for heating the settings equivalent to 30 p.ct. by weight of the charge put into the chambers. As regards the alternative to the use of lignite—viz., the manufacture of blue water gas—the consumption of coke in making the volume of water gas needed to replace the lignite gas was actually considerably less than the additional fuel needed for the settings when lignite was mixed with the coal carbonized. Thus the production of water gas in place of gas making from lignite resulted in an economy of coke and a real saving of the fuel supplies.

Heer W. J. de Vries (Hoogezand) deprecated the variability in the coal supplies—one month he received nothing but bituminous coal, and the next month nothing but No. 3 nuts, with which no lignite could be mixed. He also complained of the high freight charges on lignite to the north of Holland, where, however, no higher price could be realized for coke.

The Chairman explained that the Limburg mines had great difficulty in supplying any coal at all in the required quantity, and that screening and sorting of it in grades to suit particular requirements was seldom possible. He recognized, however, that the relative prices of through-and-through coal and cleaned coal did not represent their proportionate value to gas-works; and the point would be further considered.

Heer G. J. van Goor (Steenwyk) pointed out the disability under which a small works, normally using in the winter only one setting, was placed when it was supplied with a lot of poor coal, which entailed the use of a second setting and, consequently, a much greater consumption of coke for heating the retorts.

Heer J. Ph. Bruinwold Riedel thought it likely that, in existing circumstances, people who cooked by gas in the summer would be impelled to use the domestic fire, which was required for heating and for cooking also, and that the winter gas consumption might thereby be very little higher than the summer consumption. This would relieve the last speaker of his winter difficulty.

At this point, the meeting was adjourned to the following day (July 12), when the discussion of the same subject was resumed at half-past nine by Heer P. Bolsius, of Bois-le-Duc, who referred to the large proportion of coke breeze obtained from the poor coal, which greatly reduced the receipts of the gas-works from the sale of coke. The Chairman suggested that the lignite coke should be briquetted, in cases where lignite was carbonized apart from the coal, and that there were many small industrial uses for coke breeze, which also could be used in small closed stoves, for which purposes it was sold in Amsterdam at somewhere about half the price ot coke.

Heer J. Ph. Bruinwold Riedel said that egg briquettes suitable for consumption on the spot could be made from lignite and poor coal without the use of binding material; while better briquettes could be made with the addition of peat as a binding material. Heer J. S. Noordhof (Zwolle) referred to the enormous breach which the Zwolle Electricity Works had made in his lighting business as a consequence of the rationing of fuel. Heer E. E. van Rhijn said that the carbonization of lignite, poor coal, &c., lowered the strength of the virgin liquor so much that it was hardly possible to work it up to sulphate. Heer Th. Ferkranus stated, however, that in his works this trouble had been overcome by pumping the liquor back into the hydraulic main three, four, or five times. Heer J. Bolt (Assen) suggested that the weak liquor should be used instead of water in the "Standard" washer; and the Chairman said that at Amsterdam it had been first concentrated in the sulphate-house, which procedure, however, involved a double expenditure of steam. Heer W. Niermeyer (Arnheim) pointed out that the weak liquor must be introduced at about the third chamber of the washer, and clean water in the first; otherwise clean gas would not be obtained.

In answer to questions as to the briquetting of coke breeze, &c., Heer M. C. Sissingh (Rotterdam) said that he used a briquetting plant obtained from Oosterhout, and made briquettes by adding about 8 p.ct. of loam to the coke breeze. These briquettes were used on the works, and would doubtless stand transport locally in a small town. Heer W. Niermeyer said they were doing the same in Arnheim with lignite and 8 p.ct. of loam or clay. This speaker also referred to the lowering of the grade of gas, and its relation to the more intensive competition of electricity works. While the Coal Distribution Department recommended about 420 B.Th.U. per cubic foot, some were working to 375 to 390 B.Th.U., and in one case 315 B.Th.U. was spoken of. The Chairman said that, apart from temporary exigencies, it seemed likely that 420 to 470 B.Th.U. per cubic foot would be acceptable; but it was difficult to forecast the future in this respect.

The meeting then passed on to the discussion of the regulations for the restriction of gas consumption.

(To be continued.)

SELECTIVE PRESSURE CONTROL.

The following description has been given by Mr. M. D. Dexter in the Chicago "Gas Record," of a simple method for controlling station and district governors,

There have been many changes in gas distribution since I started in the gas business in Columbus (Georgia), in 1895. In those days, the evening load was the only peak. We carried 1½ in. day pressure, and increased this to 2 in., or a little better, for the night load. The works governor was a Foulis, and the pressure was controlled by the addition or removal of weights by hand.

Automatic Regulation Experiments.

I tried sand (as in an hourglass) and then a pan of water as a weight, and had an alarm clock to turn a cock and let the water slowly escape—but soon discarded this, as it was difficult to discharge a small amount of water by gravity over a long enough period of time.

We soon had breakfast and dinner peaks; and it became necessary to increase average pressures, with the result that the installation of a booster was necessary, since the holder did not throw sufficient pressure. Then, as business grew, and the distribution system spread out, a high-pressure line to one of the suburbs was necessary to supplement the pressure. In 1914 a larger holder was built, and an automatic governor installed; and I was much disappointed, since it never did the work we wanted of it. At the beginning of a peak, it would commence to load; but when the high-pressure line to the suburb began to supply its share of the load, the automatic governor proceeded to unload, with the result that we made the pressure changes by hand. I was determined, however, to eliminate the personal factor, and give the proper service and keep leakage at a minimum; for average pressures now had increased to 4 and 6 in.

I had become convinced that the pressures to be carried at the works should be determined from pressure records from different parts of the distribution system; but to carry out such a plan by hand-control would mean almost constant attention. I then designed the system of control which has been tried for eighteen months. It is so simple that one asks why it was not thought of before. All efforts in the past to effect pressure changes by mechanical means have been so cumbersome and unreliable that they have never been used, though a number of patents have been issued.

Principle of Control.

This control is applicable to the station or district governors already in use, and the only mechanical power required is the clockwork in a recording gauge, without affecting its utility as a recording gauge. The pressure increases and decreases, instead of by dead-weights or mercury, or by pneumatic means. This in itself is not new, since the Foulis governor I mentioned using in 1895 was so controlled—that is, the small holder on which weights were added or removed was connected by an air pipe-line to the governor. Any governor can be converted to pneumatic control by rendering the space above the diaphragm or float air and gas tight. Then if pneumatic pressure is applied, the delivery pressure will be increased by a similar amount. The problem I have worked out is how to apply and remove this pneumatic pressure in varying extent as to time and quantity. The principle used is that, if a pipe having a small supply of gas has one end open to the atmosphere, there is no pressure in it; but if this open end is submerged in a liquid, the pressure will be in proportion to the depth of submergence.

Description.

Only a small amount of gas is required—not more than for the pilot of a gas-lamp. This gas is taken from the gas-pipe to the recording gauge. The gas is regulated by a needle-valve, and is fed into a pipe, the lower end of which connects with the enclosed space above the float or diaphragm of the governor, which pre-

viously has been weighted to deliver the minimum pressure to be carried. The upper end of this pipe leads through a flexible tube to a tube supported on the end of an L-shaped lever. The end of this tube is open, and normally is just above the level of the mercury in the receptacle. The upper end of the L-shaped lever has a grooved roller, which rests on the outer edge of a pasteboard disc placed under the regular chart of the recording gauge. Now, the governor continues to act as a balance governor, since the pipe-line is open to the atmosphere, and there is no additional pressure on the top of the diaphragm or float. The open-ended tube is surrounded by a larger open ended tube, also mounted on the lever, to collect the escaping gas passing through the upper flexible tube to the pipe serving as a vent from the room.

Now, if depressions are cut in the outer edge of the pasteboard disc, the lever by gravity lowers the open ended tube in the mercury, and the pressure is built up in proportion to the depth of submergence. This disc is printed with radial lines representing the twenty-four hours of the day, and circumferential lines for the amount of pressure increase. The angle of the cuts determines the time required to effect a given change. It is evident that any line of desirable pressure curve can be produced by cutting out the pasteboard disc with a pair of scissors. A micrometer adjustment can be had by means of the screw-threads on the stem of the mercury cup—raising the mercury level having the same effect as lowering the open-ended tube.

Influence of B.Th.U. on Mantle Efficiency.

In Technological Paper No. 110 of the United States Bureau of Standards, Messrs. M'Bride, Dunkley, Crittenden, and Taylor deal with tests regarding the operation of incandescent gas-lamps. They remark that the point of maximum efficiency for a given lamp occurs at a lower gas consumption than the point of maximum candle power. Therefore, in reducing the gas consumption slightly below the maximum candle power point, the lamp is actually brought nearer to its point of maximum efficiency. A study of the pressure efficiency curves, reveals the fact that this slight decrease in the gas consumption may have still another helpful effect. Such a change in adjustment will assist in correcting the effects of changes in gas pressure in cases where the pressure at which the lamp is operated is higher than the pressure at time of adjustment. In comparisons between lean water gas and a town supply of rich mixed gas, upright lamps showed a distinctly higher efficiency with the lean water gas than with the town gas, both at maximum candle power and maximum efficiency of adjustment; and the advantage was greater at maximum candle power than at maximum efficiency. Inverted lamps showed no difference in efficiency, within the limits of experimental uncertainties, either at maximum efficiency or maximum candle power adjustment. With both upright and inverted lamps at either maximum candle power or maximum efficiency there was a distinct but small advantage of water gas over coal gas of the same total heating value, except in some cases at very low pressures. This advantage of water gas over coal gas, it is said, probably results largely from the smaller loss of heat in the products with water gas than with coal gas of the same heating value. The lower net heating value is also a result of this. However, there are some differences in flame characteristics that result from difference in the proportions of hydrogen, carbon monoxide, and hydrocarbons; and these are perhaps fully as important as the differences in heat losses. Tests using water gas of from 540 to 575 B.Th.U., town gas of 625 to 660 B.Th.U., and gas specially enriched with benzene vapour to about 750 B.Th.U., showed in most cases a distinct increase in operating efficiency when a lamp adjusted to maximum candle power with one gas was operated on a leaner gas without change of adjustment, and a more marked decrease in efficiency when a lamp adjusted with lean gas was operated with richer gas—all other conditions remaining unchanged. Very generally, it was found that a given fluctuation in gas quality produces less change in the efficiency of operation of a lamp with lean gas than with rich gas. If a lamp is adjusted for maximum candle power, an increase in the heating value of the gas supplied to it produces a decrease in efficiency; and a decrease in the heating value produces an increase in efficiency.

"Reconstruction Problems," Nos. 11 and 12, issued, price 2d. each, by the Ministry of Reconstruction, deal respectively with Commercial Forestry and the Re-Settlement of Officers (Army and R.A.F.). Both pamphlets contain a good deal of information with regard to their particular part of the big question of reconstruction.

Among the announcements of forthcoming meetings of the Royal Society of Arts, is a paper on March 19 by Sir Dugald Clerk, K.B.E., D.Sc., F.R.S., on the "Distribution of Heat, Light, and Motive Power by Gas and Electricity;" and a series of three Cantor Lectures by Prof. William A. Bone, D.Sc., Ph.D., F.R.S., on "Fuel Economy," on March 10, 17, and 24.

In reference to the Calcium Carbide Order of 1917, and to the intimation in November last, fixing maximum prices and removing certain restrictions on dealings in calcium carbide, notice is given by the Minister of Munitions that, on and after Feb. 1, the maximum prices for dealings in calcium carbide are amended, and will be as follows for quantities of 110 lbs. and over, exclusive of carriage charges; £30 per ton for lump sizes; and £30 10s. per ton for granulated sizes up to 15/25 m.m.

SOFT COAL FOR WATER GAS.

Mention was made in the "JOURNAL" last month [p. 521] of experiments which are being carried out by the State Geological Survey, in co-operation with the United States Bureau of Mines and the Illinois State University, in connection with the possibility of using low-sulphur bituminous coals from Illinois, Indiana, and Western Kentucky in the manufacture of coal and water gas; and quotation was made from a lately-published Bulletin on "Water-Gas Manufacture with Central District Bituminous Coals as Generator Fuel." There has since appeared in the "Gas Record" a long article dealing with the same subject, by Mr. Robert B. Harper, the Chief Chemist to the People's Gas Light and Coke Company of Chicago. In this, Mr. Harper closely analyzes the factors affecting the use of bituminous coal in water-gas generators; and as the result of the investigations made, he summarizes as follows the principal features and matters of interest concerned in a change in the composition of the generator fuel from that of a good coke to that of a bituminous coal.

(1) In the quantity of clinker or ash to be removed being increased, and hence increasing the "cleaning time," and thus reducing the gas made per day by as much as 5 p.ct.

(2) In the ash of the coal used forming troublesome clinker, and hence reducing the volume of gas made daily, due to increased "cleaning time," though the quantity of the ash is not materially changed.

(3) In the lumps or coarseness of the ash from the coal presenting less surface for chemical action, affecting the composition, and hence the fusion-point and physical condition, of the resulting clinker.

(4) In the liberation of considerable volatile matter from the coal, which, upon being driven off during the blast or blow, appears at the open stack-valve more or less as a smoke.

(5) In the increase of the heating value, and perhaps also of the sensible heat, of the so-called producer gas, tending to result in an overheating or undesirable risein temperature of the chequer-brick in the carburettor and superheater.

(6) In the volume of the output of blue water gas from the generator, decreasing in rough proportion to the decrease in the percentage of fixed carbon in the fuels used, and in some cases decreasing by nearly 40 p.ct. and resulting in a decrease in volume of crude carburetted water gas made of nearly 35 p.ct.

(7) In the increase of the time of contact of the oil vapours and gases with the blue water gas and the brick surface in the carburettor and superheater, due to the decrease in the rate of output of blue water gas from the generator, with the resulting tendency to a more extensive cracking and less efficient decomposition of the oil at the same chequer-brick temperature used when the generator fuel is coke.

(8) In the composition of the blue water gas formed in the generator being changed by the liberation of some volatile matter, so that the heating value of the blue water gas tends to be increased at times as much as 40 B.Th.U. per cubic foot, thus making possible in some cases a slight oil saving in the manufacture of a carburetted water gas.

(9) In the possibly detrimental effect of the composition of the blue water gas made from soft coal upon the composition of the crude oil gas produced in the gas machine, and the tendency to possibly increase the deposition of carbon on the chequer-brick and the amount of tar formed.

(10) In the formation of more hydrogen sulphide, due to an increase in the percentage of total sulphur in the generator fuel charged, which may tend to so increase the content of the hydrogen sulphide in the crude carburetted water gas as to overload the existing purifying equipment.

(11) In the free space for gases in the generator fuel being subject to rather wide variation, due to a tendency of bituminous coal to contribute to the forming of "channels" or "chimneys" in the fuel bed, or a caked or packed condition of the fuel—both conditions being detrimental to good results.

(12) In the concentration or amount of fuel in the generator at any one time being possibly decreased, or, in other words, a shallower depth of fuel bed maintained, in order to permit primary or main blast air to pass more readily through the fire.

(13) In the possible tendency of the ash of some coals, under certain blast conditions or rates of input of air, to blow-over from the generator and form deposits on the chequer-brick, thus usually rendering efficient decomposition or proper cracking of the gas oil less likely.

(14) In the formation, with some coals, of a clinker or ash of such a nature as to cause a loss of practically unrecoverable carbon or fragments of fuel amounting, in some cases, to as much as 3 p.ct. of the fuel charged into the generator.

(15) In the increase of the amount of steam used per 1000 c.ft. of gas made, due possibly to the necessity of using a greater quantity of steam in order to keep the physical conditions of the clinker such as to permit the ready removal of the ash or clinker.

(16) In the probable lowering of the temperature of the generator fuel surface, because of the smaller amount of surface and more compact nature of bituminous coal tending to increase the excess steam leaving the generator, and (because of the latter) possibly tending to have a somewhat detrimental effect upon the gas oil decomposition.

(17) In the securing of some economies in the manufacture of carburetted water gas in the case where the difference in costs of coke and bituminous coal is sufficiently large and other conditions permit advantage being taken of such possible economies.

(18) In the impossibility of manufacturing enough carburetted water gas with bituminous coal to meet the requirements of the customers of a gas company whose maximum possible gas machine capacity with good coke is only sufficient to meet such requirements.

Temporary Increase of Charges Act.—An Order has been made by the Local Government Board enabling the Barry Urban District Council to raise their maximum price from 3s. 6d. to 4s. 6d. per 1000 c.ft.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Fuel Oil from Continuous Vertical Retorts.

SIR,—I am sorry that circumstances have prevented me replying to your article of Dec. 24 earlier.

In the first place, you state that my criticism in reference to continuous vertical retorts and liquid fuel is "absolutely unfair and, in fact, not altogether true." In my paper I gave full credit to those who had undertaken the work, and stated that "the gas engineers rose to the occasion." Could anything be fairer than that? The figures as to capital cost I quoted were from Hansard, and were given in a reply by Mr. Kellaway to Captain Wright in the House of Commons.

In your criticism you remark: "Then, again, he states that the cost of the conversion of the retorts was £100,000; while the fact is the total cost of any so-called 'conversion' of plants, and of completing one plant, was £50,500." You then go on to state: "A good proportion of the balance of the money was spent on extra condensers, scrubbing plant, and other things; for example, at some works superheaters for the steam were installed. It is, therefore, quite untrue to say the money—a sum of £100,000!—was spent on the retorts." Apparently, therefore, you agree that £100,000 was spent—a portion of it only on the retorts, but the rest for condensers, scrubbing plant, superheaters, &c. I fail to see that my remarks were untrue.

Obviously, if a larger amount of steam is being employed, extra condensing surface would be required, and, therefore, all the etceteras to which you refer were part of the scheme of conversion.

Furthermore, you refer to "pressure being brought to bear upon the Government to adopt low-temperature carbonization a few short months ago." As a matter of fact, the Government was pressed to assist in the erection of low-temperature carbonization plants shortly after the outbreak of war; and it is well known that definite offers were made to the Government in 1915. It was largely as a direct result of the pressure which was brought to bear in connection with these overtures that at length the Government moved in the matter and founded the Petroleum Research Department. It is, therefore, incorrect to state that this pressure was only brought to bear "a few short months ago," or that plants could not have been completed before the signing of the armistice. Even had the recommendations of the Petroleum Research Department been adopted when made in 1917, there would have been ample time to complete the erection of these retorts, and have brought them to a stage of production—providing always that the Department responsible for construction (or production) had been staffed with competent officials desirous of obtaining oil.

It is also difficult to conclude that, had the proposals put forward been adopted, the cannel or other bituminous material required could not have been available for them, although you point out that it was available for the converted gas-works retorts.

Proceeding, you go on to say "even when eventually finished, who knows that on the large scale and in every-day working conditions they would have been a success?" Who knows they would not? But, had you had the advantage of allowing your pen to wander with a satisfactory guide, you would know that a very important meeting was held early in 1917, when this subject was fully discussed at the Hotel Metropole. The urgent necessity for the production of oil was dealt with, and the advantages of low-temperature carbonization were pointed out. It was also pointed out that the necessity for producing every possible gallon of oil was such that the development of the industry should go ahead with all possible speed, irrespective of whether or not the project could ultimately be carried on as a commercial proposition. Whatever risk there was or might be, it was decided that this risk should be taken; and neither myself nor any other chemist or Government Adviser was asked to guarantee that the operation would be commercially successful. I take it that neither were the gas-works!

In your remarks you only refer to the costs of working the Nottingham plant. But what were the costs of Dundee and Bradford? It would be interesting if the managers of these three undertakings—Nottingham, Dundee, and Bradford—could give:

(1) Costs for the extra steam required.
(2) The amount of coke available for sale.
(3) The amount which had to be dumped because it was not of sufficiently good quality.
(4) The throughput of the retorts compared to the working under ordinary conditions.
(5) The quantity of fuel oil obtained per ton of coal carbonized.
(6) The price per ton obtained for the coke.
(7) The yield of gas and the amount of sulphate of ammonia.

You seem to think that I objected to the employment of the gas-retorts as a war emergency. As a matter of fact I was quite in favour of using every source from which oil might be obtained. On Nov. 20, 1917, I wrote to Mr. West, and said I believed the Glover-West retorts should act admirably for obtaining oil if plenty of steam was used and the upper flues strongly heated. This shows that I was alive to the possibilities of obtaining oil on vertical retorts. But I also realized that this would not be sufficient; and it was necessary that every available source should be employed.

F. MOLLWO PERKIN.

Albion House, 59, New Oxford Street, W.C.1.,
Jan. 16, 1919.

[The above letter is the subject of an editorial article on p. 107 of this issue.—ED. G.J.]

Dry Meters.

SIR,—During the past twelve months or so, we have had a considerable number of dry meters that have stopped registering—chiefly those of comparatively recent date. Indeed, the number of cases has become very alarming; so much so, that I am afraid to order any more meters.

The system of working here is the same as it always has been. It cannot, therefore, be put down to any change in that. Is the material from which the meters are now made, or the workmanship, as good as formerly? There is a cause for it, which must be remedied, or we shall be compelled to revert again to wet meters.

May I ask through the "JOURNAL" if similar trouble is experienced elsewhere; and, if so, what steps are being taken to effect a remedy?

J. G. HAWKINS, Manager.

Wisbech Lighting Company, Jan. 16, 1919.

REGISTER OF PATENTS.

Storing Coal Gas for Use in Internal Combustion Engines.—No. 120,967.

MOODY, A. R., of Stoke-on-Trent.

No. 17,472; Nov. 26, 1917.

This invention has for its object to provide means whereby coal gas for motor-vehicles can be stored in small space without compression. It has previously been proposed to employ finely-divided carbon for storing gas—"it having been found that a larger quantity could be introduced into a storage chamber so charged with charcoal than into an empty chamber;" and it has further been suggested to increase the degree of absorption by applying pressure. The patentee's proposal is to provide a gas-tight storage tank to contain the charcoal, with means for connection to a charging pipe and to the induction conduit of an engine when the charging pipe has been removed. The charcoal is carried in a gauze container within the storage chamber; while a detachable cover is provided so that the container can be taken out when the charcoal requires replenishing.

Burning Explosive Gaseous Mixtures.—No. 112,011.

SURFACE COMBUSTION COMPANY, INCORPORATED, Assignees of C. E. RICHARDSON, W. B. EDDISON, and H. L. READ, all of New York City.

No. 15,038; Nov. 1, 1917. Convention date, Nov. 23, 1916.

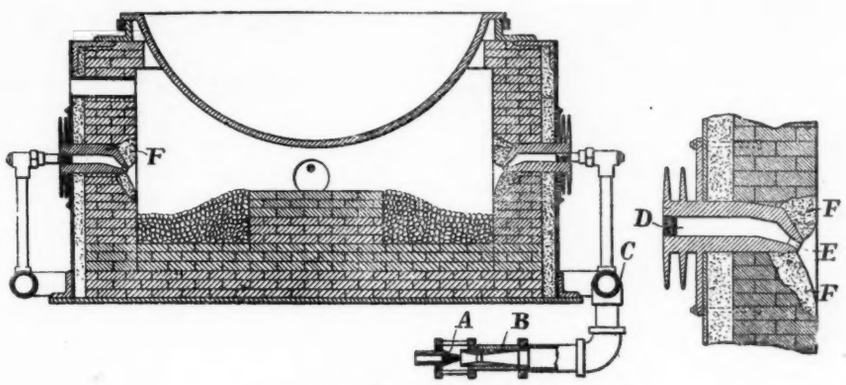
The invention relates to apparatus in which continuous and localized combustion of an explosive gaseous mixture is secured by causing the mixture to flow from a discharge orifice with a velocity greater than the rate of propagation of inflammation of the mixture in order to prevent back-flashing, and then causing the mixture to spread out with rapid reduction of its flow velocity, and burning the mixture where its flow velocity equals the rate of propagation of inflammation of the mixture. By such continuous and localized combustion, the patentees remark, extremely high temperatures are developed, but various practical difficulties have been experienced, due to the heating of the walls of the mixture discharge passage. It is found that as the walls become heated, combustion of a portion of the flowing mixture tends to take place within the mouth of the orifice and to gradually work back along the passage, while the main portion of the mixture is flowing on, unburned, to be consumed at the place where its flow velocity has been reduced to the rate of propagation of inflammation. It is the object of the present invention to avoid this back-creeping of any part of the mixture within the discharge passage or orifice, even with a comparatively low mixture flow velocity; and this result is secured by means whereby all parts of the walls of the discharge orifice are prevented from becoming heated to the ignition temperature of the mixture.

A central sectional view of a soft metal melting furnace made in accordance with the invention is shown on p. 123, with an enlarged section of one of the mixture discharge nozzles and adjacent portions of the furnace walls.

The furnace may be of any desired shape in horizontal section. The one shown is circular; the mixture discharge nozzles (of which there may be any number) being arranged radially in the cylindrical side wall. The explosive mixture is supplied to the discharge nozzles under the necessary pressure to cause the mixture to be discharged with a velocity in excess of the rate of propagation of inflammation of the mixture. The gas is led to the injector nozzle A under suitable pressure, and air is drawn into the combining tube of the injector by the gas-jet. The gas and air then pass through the neck of the injector and through the discharge cone B to a supply pipe or manifold C, from which branches lead to several nozzles. The injector should be so designed, and the nozzle and combining tube set in proper relative position (as by adjusting either one), to supply a mixture containing the gas and air in suitable proportions. The manifold and supply branches should be large enough to permit the mixture to move in them with such comparatively low velocity as to secure a substantially uniform supply of mixture to all the nozzles, and to avoid pressure losses due to pipe friction.

The nozzles are formed each with a bore or passage D extending through the body of the nozzle of a size substantially greater than that of the discharge orifice; and this passage tapers down at the front or discharge end of the nozzle and terminates in a restricted short discharge passage or orifice E, which has parallel walls for a length sufficient to cause the mixture to be discharged in the form of a solid jet or stream. The nozzle is formed of material of high thermal conductivity—and is made of sufficient cross-section so that all parts of it shall have the required heat conducting capacity for carrying away at the necessary rate all heat reaching it. It is set in the furnace wall and protected by the wall from direct access of the furnace heat, except for a limited portion of its discharge end or nose adjacent the orifice. The end of the nozzle has a blunt edge to provide a flat narrow annular face about the orifice to be left uncovered and exposed to the furnace heat.

The nozzle is protected from direct access of furnace heat, both for the purpose of keeping down to a minimum the loss of heat through



Surface Combustion Company's Plant.

the nozzle walls and to avoid unduly increasing the size of the nozzle to give it the necessary heat-carrying capacity. On the other hand, it is necessary that there should be some extent of metal about the edge of the discharge orifice exposed to direct access of heat from the furnace chamber, in order to prevent contact with the stream of mixture of any material of relatively low heat conductivity forming part of the furnace wall. The exposure of any great extent of the metal of the nozzle about the edge of the orifice prevents the contact of incandescent material with the mixture, and avoids the ignition of the mixture at the edge of the orifice—resulting in increase in temperature at this point, and increased tendency to back-creeping which would result from such contact.

The exact width or extent of metal left uncovered at the nose of the nozzle is not considered to be particularly important, provided it is sufficient to secure the desired result; but, in order to avoid loss of heat and the necessity of providing for the carrying away of excessive heat, it is desirable not to have it much wider than is necessary to protect the mixture from the incandescent material.

The patentees have usually found it desirable to set the nose of the nozzle slightly back from the face of the furnace wall in a small recess formed in the face of the wall, with the nose of the nozzle extending slightly into the recess, and then partly filling in the recess about the nozzle nose with some refractory cement, as indicated at F—having the cement extend not beyond the outer edge of the annular face at the end of the nozzle, and forming it to flare away from the path of the mixture stream.

Coal-Distilling Apparatus.—No. 121,496.

OIL EXTRACTORS, LTD., of Victoria Street, Westminster, and LAMPLOUGH, F., of Feltham.

No. 14,997; Oct. 16, 1917.

This invention has for its object to provide "apparatus whereby coal can be distilled at low pressure; the still being heated externally by a furnace and internally by low-pressure steam admitted to the still."

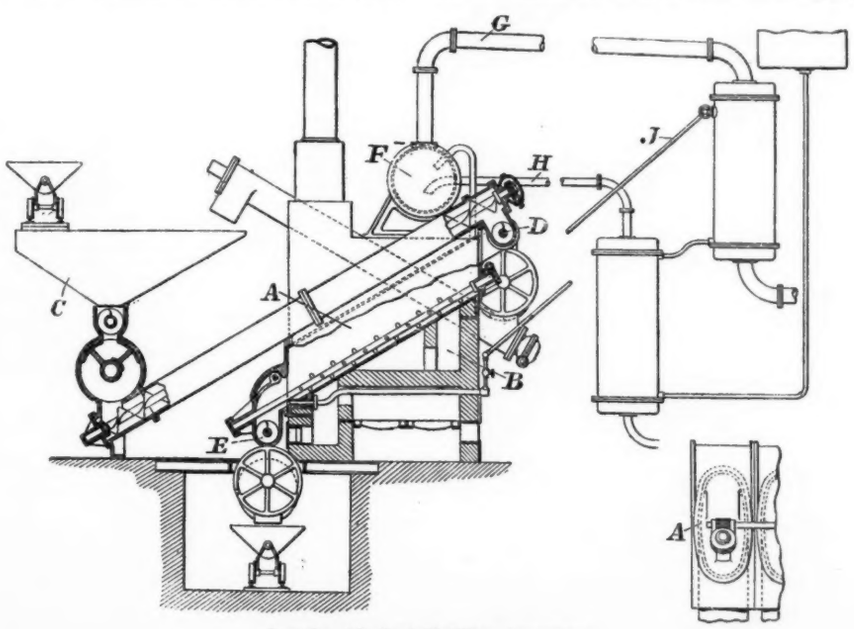
The illustration shows one method of carrying out the invention—a side elevation of the apparatus in part vertical section, and an end view of the upper portion of one of the retorts of the battery employed.

A series of retorts A, of oval cross section, are mounted side by side in a furnace chamber B. The retorts slope upwards from the bottom to the top of the furnace chamber, and the long diameter of each retort is placed approximately vertical. In each retort is a stirrer with lateral arms (placed in the curved bottom of the retort and driven by an outside shaft) to prevent the coal from caking. A hopper C supplies coal to a hermetically sealed worm conveyor through a hermetically sealed valve, which receives coal between its arms when in the position shown, then moves forward and discharges the coal into the conveyor, without at any time providing throughway communication between the hopper and the conveyor.

The worm conveyor referred to discharges into a second worm conveyor D, which traverses all the retorts and communicates with the upper end of each. The delivery end of No. 1 conveyor and the receiving end of No. 2 conveyor, although communicating with one another, are hermetically sealed relatively to the external atmosphere; and the delivery end of the retort feeds into another hermetically sealed valve, whereby any surplus coal is discharged into a return worm conveyor whose delivery end is over the hopper C. Thus coal fed into the hopper C is delivered to all the retorts by the conveyor D; but should these be full, the surplus coal is passed back to the hopper. At the bottom of the retort is a discharge worm conveyor E, which communicates, through a hermetically sealed valve, with a discharge mouth, whereby the spent coal is discharged from the retorts.

Above the retorts is a cylindrical expansion chamber F; and each retort has communication with it. From the top of the expansion chamber a conduit G extends to a steam generator of the tubular type; the upper ends of the tubes being in communication with the conduit G and the lower ends with a delivery conduit. From a point lower down in the expansion chamber, a second conduit H communicates with a tubular feed-water heater of the tubular type; the tubes communicating at the top with the conduit H and at the bottom with a delivery conduit. The top of the feed-water heater is connected to the bottom of the steam generator; and the top of the steam generator is connected by a conduit J to steam-pipes (one for each retort) which extend through the furnace chamber and discharge one into each of the retorts.

The operation of the apparatus is as follows: Coal being continuously fed to the retorts by the conveyors and the spent coal discharged by the conveyor E, the hot gases evolved enter the expansion chamber F and pass away—some through the conduit G and some through the conduit H. At starting, the steam generator and the feed-water heater are both full of water; and the hot gases from the conduits G and H heat the water until steam is generated in the generator and passes by the pipe J through the attached conduits (where it is superheated) into the various retorts. As the quantity of steam generated increases, the pressure drives some of the water out of the generator and thus forces part of the water back from the heater. A head is thus maintained which controls the pressure at which the steam is delivered to the retorts. Should the steam be generated too rapidly, the generator will



Lamplough's Coal-Distilling Apparatus.

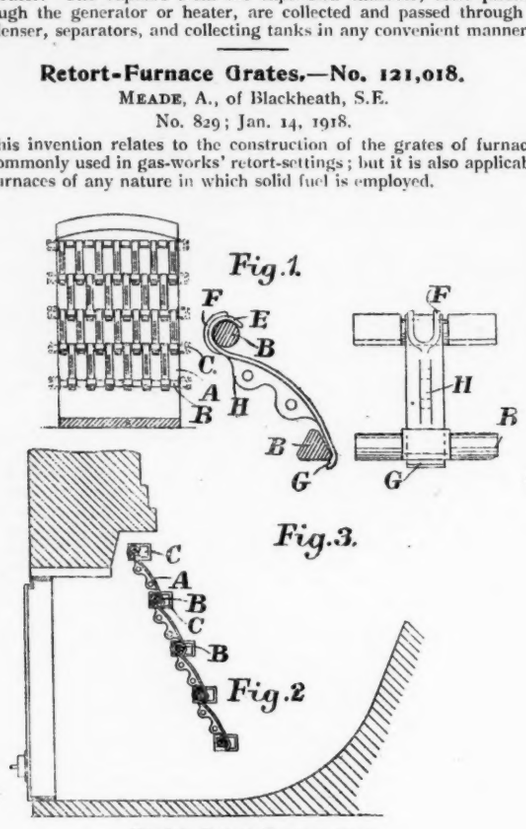
be cleared of water, so that no further steam will be generated until that in the generator has been utilized; and the steam in the generator will only be slightly superheated by reason of its remaining in the generator. The vapours from the expansion chamber, after passing through the generator or heater, are collected and passed through a condenser, separators, and collecting tanks in any convenient manner.

Retort-Furnace Grates.—No. 121,018.

MEADE, A., of Blackheath, S.E.

No. 829; Jan. 14, 1918.

This invention relates to the construction of the grates of furnaces as commonly used in gas-works' retort-settings; but it is also applicable to furnaces of any nature in which solid fuel is employed.



Meade's Retort-Furnace Grates.

Cast-iron hanger bars A (fig. 3) for supporting the fuel bed are constructed of **S**-shape from hard cast iron. The upper portion E forms a hook (strengthened by webs F), by means of which the bar is suspended from the supporting or cross bars B. The central portion is convex, so that the fuel resting upon the grate is held away from the point of attachment of the hook end E. The lower end of the hanger bar G is bent round, and (wrapping round the triangular portion of the supporting bars) effects a locking action, which prevents the bars from becoming disengaged during the process of cleaning. To the back of the bars is cast a web H, provided with two holes, into which a **Y**-shaped bar may be inserted when the removal of the bar is necessary. The bars are suspended from supports B, which are cast with parts alternately triangular and round in cross section, and provided with square extremities to rest in the supporting boxes C.

The bars B perform a double function in that (as the triangular portions protrude beyond the circular portions upon which the hanger bars are suspended) each hanger bar is maintained in its right position, while the lower end of the hanger bar engages with the base of the triangular portion of the supporting bar, and effects the locking action referred to. At the same time, while the hanger bars are locked while in their working position, each may at any time be unhooked and removed by disengaging its lower end from the triangular portion of the cross bar by applying to the lower end a slightly forward movement.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 15.]

Nos. 296—835.

CARMICHAEL, D.—"Acetylene-gas lighting-plants." No. 429.

COWDEROY, B.—"Automatic lighters for acetylene, &c., burners." No. 411.

ETNA LIGHTING AND HEATING COMPANY.—"Lamps." No. 646.

FIDLER, F.—"Gas, coal, or oil fired kilns." Nos. 392, 393.

HOPWOOD, J. M.—"Controlling combustion by flow and pressure." No. 692.

HORNE, G. F.—See Cowderoy. No. 411.

JEFFERIES, C.—"Apparatus for producing gas." No. 359.

MAXWELL, J. G.—See Fidler. Nos. 392, 393.

PACE, P. C.—"Apparatus for manufacture of air gas." No. 707.

POORE, P.—"Destructive distillation of wood, woody fibre, &c." No. 812.

RAMBUSH, N. E.—"Gas-engine power plants operated by producer plant." No. 579.

SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES.—"Process for transforming free or combined ammonia mixed with inert gases or steam into ammonium sulphate or into concentrated and pure ammonia gas." No. 395.

TONNER, M.—"Device for generating gaseous fuel for heating or firing furnaces." No. 557.

WILKINSON, G.—"Electrically-operated valve for control of gas, &c." No. 638.

MISCELLANEOUS NEWS.

REDUCED PRESSURE AT SHEFFIELD.

Interviewed by a representative of the "Sheffield Daily Telegraph," as to why the Gas Company had had to notify a reduction in pressure, the Chairman (Colonel H. K. Stephenson, M.P.) and the General Manager (Mr. Hanbury Thomas) gave some information as to the shortage in labour and machinery which is at the root of the trouble.

The Company have had the same experience as other people with regard to getting men back from the army. Form after form has been filled up; but the process of demobilization has been very slow. The number of men who have been returned so far is precisely three. During the war, about 500 men have left the service of the Company for the forces. Not all of these are expected back, of course; but a large number are wanted. It is anticipated that they will be coming before long; but in the meantime the work suffers.

The overworked state of the Company's machinery has contributed largely to the present difficulties. It has had to be kept going at very high pressure throughout the war; and breakdowns are constantly occurring. There was one of a serious character at the Grimesthorpe works the week-end before last. It takes a long time to obtain new parts for machinery, or to get repairs carried out.

Complaints are made of the great delays in securing new machinery that have been experienced during the last two years. "The whole of the trouble," said Colonel Stephenson, "has been due to the fact that we have been unable to keep our machinery in repair, to get spare parts, or to obtain renewals of the plant. Our machinery was worked at high pressure from 1914 to 1916, and about 1917 it began to wear out. The Government did not realize the importance of the matter; and the permits which they gave us for renewals were too low in order of priority, so that contractors could not proceed with the orders. Then the Government woke up to their mistake, gave us improved priority, and sent their own inspector round to get the contracts executed for us; but he was not more successful than we were, owing to the fact that the contractors had to give preference to direct War Office and Admiralty contracts. The result is that there are many things which have been on order a long time, but which we have not got yet." The cases of two machines were quoted—a discharger, which has been ordered more than a year, and is not delivered; and a charger, which was ordered two years ago, which is now being completed on the Company's premises, and has not yet got to work. Mr. Hanbury Thomas expressed the hope that it would not be necessary to resort to any further reduction of pressure, and said the fact that the days were beginning to lengthen would ease the situation somewhat.

NOTTINGHAM GAS UNDERTAKING.

Engineer's Services Recognized.

The Nottingham Corporation, at their last meeting, made substantial recognition of the great value of his work on behalf of the municipality by voting to Mr. Wilkinson, the City Gas Engineer, an increase of £250 upon his annual salary, which is thus to be raised to £1500 a year. The addition is to take effect from the time at which the payment ceases of £250 annually which is now being made by the Government to Mr. Wilkinson for his superintendence of special work, in the interests of the Ministry of Munitions, at the Radford Gas Depôt.

Radford forms one of the City's older carbonizing stations, at which the first of Nottingham's vertical plant, of the Glover-West type, was installed; this having been followed by the provision of a larger system of Woodall-Duckham verticals at the principal centre of gas manufacture and distribution at Basford. From its convenience of location and adaptability, the Radford depôt was early selected by the Ministry for the production of oil for navy purposes.

Developments at Nottingham have not been limited to the mechanical side of the undertaking; the revenue having been raised in successive years in substantial proportions until a record was achieved in 1914, when a gross profit of £131,917 was realized. Sums voted annually from earnings have saved Nottingham from formidable additions to municipal burdens; the sum allocated in relief of rates in each of the four years from 1912 to 1915, inclusive, being no less than £39,000, with proportionately large amounts in preceding and successive years. Coincidentally with this indispensable help, reserve funds have been materially augmented, with the result that the undertaking is being placed in a position to adequately safeguard existing financial interests, and make provision for potential developments.

Mr. Wilkinson, who was appointed in December, 1911, at a salary of £1000 a year, in succession to Mr. J. H. Brown, now shares the privilege with the Town Clerk of being the highest paid official in the service of the Nottingham Corporation.

CURTAILMENT OF THE TEIGNMOUTH GAS SUPPLY.

The difficulty of maintaining the supply of gas at Teignmouth was again experienced last week. On Monday evening the supply failed at 5.30, and on the following day the gas was cut off from 9 a.m. to 5 p.m. The District Council held a meeting on Wednesday to consider the question of curtailing the supply until more men can be obtained to act as stokers The Clerk (Mr. A. P. Dell) explained the steps which had been taken, including visits to the Labour Exchange at Exeter, to get the stokers who are serving in the Army released, and said that up to that time nothing had resulted.

The Gas Manager (Mr. Higham) said that at present he had three

stokers working; and the whole staff of the gas-works consisted of eight men. This was not enough to carry on the works efficiently; and it was impossible with these conditions to make the daily output of gas last the twenty-four hours. He had done his best to meet the demand, but could not do it without the necessary labour. The ordinary number of stokers was nine. Two Belgians had offered to assist until they returned to their country; but the whole position was very uncertain.

Considerable discussion took place as to the best time for reducing the supply of gas; and letters were read from a number of consumers complaining of the loss and inconvenience to which they were put by the cutting off of the supply on the days when it had to be discontinued. Eventually, it was decided to leave the matter of cutting off the supply to the Gas Manager, with the suggestion that the order of curtailment should be from 1.30 p.m. until lighting-up time in the evening, from 10 p.m. to 6 a.m., and from 9 a.m. to 11.30 a.m. Mr. French said that certain consumers and ratepayers blamed the Gas Manager for what had occurred; but they were wrong. No one could have done more than Mr. Higham had done in the circumstances. Mr. Foster said the real blame rested upon those who kept the men in the Army, if anyone was to blame at all. They had let the stokers go into the Army, and now could not get them out.

MR. A. H. BARKER ON GAS-FIRES.

In the course of the second of his series of Chadwick Lectures on "Fuel Economy and Health," at the Royal Society of Arts, on Monday of last week, Mr. A. H. BARKER made a few references to gas. Describing the gas-radiator, he said that the heat really came from the burning of an open gas-flame in the room; and the addition of the radiator did not alter one iota the amount of heat obtained in the room. It was, however, cheap and simple, but very unhygienic, except when ventilation was ample; and, generally speaking, this form of heating was regarded as undesirable on hygienic grounds, and was not recommended except for halls and similar places where a strong current of air was available. For the heating of rooms, gas-fires were pleasing, and gave practically ideal results; but the disadvantages were that the cost of maintenance was relatively high—three times that of a coal-fire, even at the present exorbitant price of coal—and a gas-fire was far from handsome to look at. The flame of a gas-fire was too uniform to be really pleasing. It was far from being as attractive as the sparkling effect of a coal-fire; and if it were to be made so, gas-fire manufacturers would have to pay much more attention to the artistic side than they had done up to the present.

At the close of the lecture, a number of questions were asked.

Mr. J. G. CLARK, alluding to Mr. Barker's reference to the gas-radiator, said this resolved itself into a question of choosing the best type of apparatus for the purpose in view. Supplementing the lecturer's comments on the psychological effect of the temperature of the room upon different people, and how imagination often played a part, Mr. Clark mentioned an instance that once came under his notice (in connection with a workshop), which he had to investigate. When he went there on the first occasion, the place was extremely hot; and when he asked the workmen whether they did not find it unduly hot, they pointed to the thermometer, and said it was only registering 60°. When he tested the thermometer with a new one, he found it was nearly 10° too high. He replaced the old thermometer with the new one, but asked the men to keep the temperature conditions as they were when he first tested them until he came again, as he wished to make certain measurements. On returning a few days later, he found the place much cooler, and down to 60° by the new thermometer. When he asked the reason, they said that when the new thermometer showed 70°, it was too oppressive.

Mr. BARKER, on the point of gas-radiators and gas-fires, said there were many objections to the radiator; but he personally would rather have one in the hall of his house than go cold. The gas-fire, on the other hand, when properly installed, had very few objections, except cost of maintenance, the monotonous appearance of the flame, and the ugliness of the design. A good way to test whether a gas-fire was burning satisfactorily was to apply a match to a piece of brown paper which had previously been soaked in saltpetre and dried, and hold the smouldering paper under the hood of the fire. If the smoke from the paper was drawn-up under the hood, the fire was burning properly. If it came out of the hood, it showed that the products of combustion were coming into the room. This test should not be applied until the fire had been alight a few minutes, as many gas-fires did not carry off the products of combustion until they had been burning a little while. Until ten years ago, the construction of gas-fires was not properly understood; but it was very well understood to-day. The gas people had probably devoted more attion to the scientific aspects of heating than to anything else; and they now knew a great deal about gas-fires. He believed the gas-fire had been made more efficient than it ought to be in respect of the radiant energy emitted. It would be much better for ordinary warming purposes if it did not convert so large a proportion into radiant heat, because it tended to be too "scorchy" for an ordinary sized room. If it warmed the air rather more, and radiated a little less heat, it would, in his opinion, be more efficient for the purpose for which it was designed.

Purely a Matter of Opinion!—The following dialogue took place at the Ashton-under-Lyne Police Court on Monday of last week, when, asked by the Magistrate's Clerk what his wages were, a defendant, a gas stoker, replied "50s." The Clerk: But this statement from your employers says that you earned £3 19s. 7d. last week. Defendant: That's for extra work. The Clerk: Oh!

MAIN D. S. O. FIRES

FOR FUEL ECONOMY.

HYGIENIC AND EFFICIENT.

Made in 55 sizes with a pleasing variety of designs.

Component parts are interchangeable, with Burners reversible, throughout each series.

Special Prices. . . . . Write for latest List.

ORDER NOW WHILE MATERIAL IS AVAILABLE.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N. 18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOWROOMS and BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

THE GAS INDUSTRY AND HOUSING SCHEMES.

With the issue of the "Builder" for the 3rd inst., there was a thirty-two page supplement illustrative of selected examples from various housing schemes, &c. Much of the reading-matter space was also devoted to the same subject; and the following particulars and comments are taken from an article headed "Housing Schemes and the Gas Industry."

The gas industry will, no doubt, play a fairly large part in the internal arrangements of those housing schemes which come within reasonable distances of gas-mains. Indeed, when due consideration is given to the enormous number of gas lighting and cooking installations with automatic meter attachments which are at present to be found in working-class homes, it would seem that the demand for installations of at least equal magnitude will be so great in most of the new housing schemes that where gas-mains are not reasonably close it will be found advisable, wherever it is possible, to run suitable mains to the locality. Many of the essentials—such as the saving of labour, the supply of hot water to the sink and bath, less dust and dirt, &c.—which are asked for by housing reformers, are practically unobtainable without extending the use of gas appliances in the homes of the people, though, no doubt, a judicious combination of gaseous and solid fuel will prove to be necessary. That the trend of events is in this direction, is to an extent borne out in the case of two Government schemes in the Greater London area, one of which has been completed several years, while the other is now in course of erection.

Well Hall Estate, Eltham, Kent.

This scheme, for housing munition workers at Woolwich Arsenal, comprises 1298 houses and flats. The work was completed in 1915. The houses are in four classes. Class I. houses contain: Lobby, living-room, parlour, scullery, four bedrooms, and bathroom. The following are details of the lighting, cooking, and hot-water installations of this class. The other classes are fitted in exactly the same manner.

Lighting.—Inverted incandescent gas-burners are used throughout. The carcase pipes to all the points were carried out in iron barrel; and a 5-light automatic meter was fixed in each coal-house. The style of gas-fitting and burner fitted, with approximate candle-power and hourly consumptions stated, are shown in Table I.

Cooking.—A coal-range is installed in the living-room, and a gas cooking-stove in the scullery.

Water Heating.—A saddle-boiler, behind the coal-range in the living-room, provides hot water to the taps at the sink and bath. A solid fuel copper is fixed in the scullery.

Roe Green Estate, Hendon.

The buildings are in course of erection; and, as the same Government Department are responsible as was the case in the last-mentioned scheme, any variations may reasonably be looked upon as either the result of experience gained at Well Hall and other places, or owing to special local conditions. The houses are of five types.

Table I.

Ground Floor.

Position.	Fittings.	Burner.	Average Candle Power.*	Average Consumption Per Hour.* C.Ft.
Lobby	Single pendant	"Bijou"	30	1½
Living-room	Double ,,	Medium	120	3 each
Parlour	Single ,,	Full size	90	4½
Bedroom	Single ,,	Medium	60	3
Scullery	Single ,,	"Bijou"	30	1½
First Floor.				
Bedrooms 1, 2, and 3	Single burner pendant in each	Medium	60 each	3 each
Bathroom	Bracket	"Bijou"	30	1½

Note.—The makers claim greater candle powers and lower consumptions; but those quoted are probably fair average efficiencies over an extended period.

Lighting.—They are all lighted by gas throughout; and inverted incandescent burners are used. The whole of the carcase pipes are in iron barrel, run on the face of the wall in the scullery, but chased-in the plaster everywhere else. A 10-light automatic meter is fixed in a cupboard under the stairs. No. 1 Type house consists of the following accommodation: Lobby, living-room, parlour, scullery, three bedrooms, and bathroom; and in Table II. are particulars of the fittings.

Table II.

Position.	Fittings.	Size of Burner.	Average Candle Power.*	Average Consumption per Hour.* C.Ft.
Lobby	Bracket	"Bijou"	30	1½
Living-room	Single pendant	Full size	90	4½
Parlour*	Single ,,	Medium	60	3
Scullery	Single ,,	"Bijou"	30	1½
Bedrooms Nos. 1 and 2	Single ,, in each	Medium	60 each	3 each
Bedroom No. 3	Bracket	"Bijou"	30	1½
Bathroom	Bracket	"Bijou"	30	1½

* See note *re* Well Hall.

The fittings carrying the burners are of very plain design, in black iron barrel to tone with the general scheme of decorations. The medium-size and "Bijou" burners will be fitted with special galleries, made to take globes one size larger than those usually supplied with similar size burners, as this gives a more striking appearance to the fitting, and adds to the lighting effect; and the fact that the mantle is farther from the glass makes breakages infrequent, which reduces the cost of maintenance to a low figure.

Cooking.—In this type a coal-range will be fitted in the living-room,

USE Simmance's

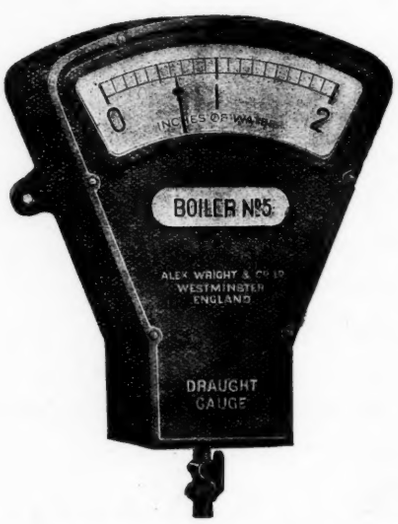
DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.



Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

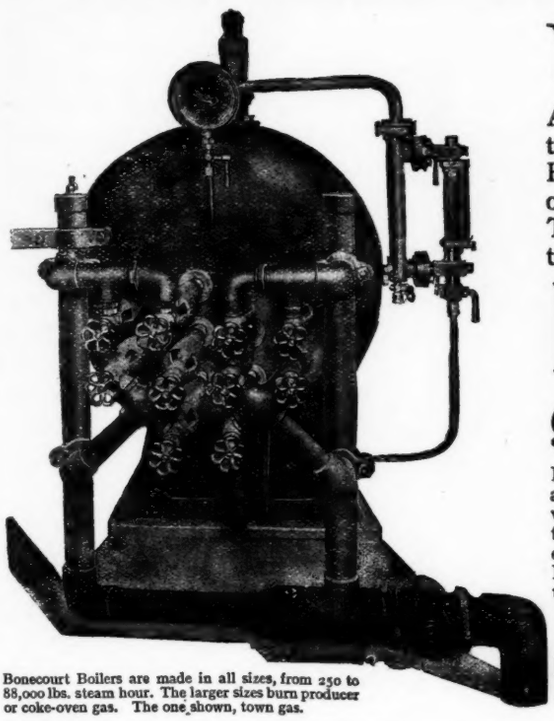
Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

Three times the steam with far less gas.



Bonecourt Boilers are made in all sizes, from 250 to 88,000 lbs. steam hour. The larger sizes burn producer or coke-oven gas. The one shown, town gas.

YOU can obtain more steam per cubic foot of gas from a Bonecourt Gas-Fired Boiler than from any other. A thermal efficiency up to 92·7 % is obtainable with the Boiler and Feed Heater, which is far higher than that of other boilers operating on either Town or Producer gas, whilst its evaporative capacity is three times as great.

BONECOURT *Gas-fired* BOILER

Brickwork, flues, and chimney are not required with a Bonecourt. This is a self-contained unit which will stand on any rigid floor. So simple is it that the slight attention required can be given by unskilled or female labour. Explosions are almost impossible. In capital cost, reduced fuel costs, and labour charges this boiler has everything to recommend it.

OUR LATEST LIST, "A BOILER EQUAL TO THREE," WILL BE SENT YOU ON REQUEST.

BONECOURT WASTE HEAT BOILER Co., Ltd.,
PARLIAMENT MANS., VICTORIA ST., LONDON, S.W.1.

The Housing Scheme.

The "Economic" Wash Boiler.

Supplied in sizes of 10, 12 and 14 gallons capacity, Richmond's "Economic" Wash Boiler is of exceptional suitability for new houses, and can be provided with connection for supply to bath where this is on the same floor. Strongly constructed with galvanised sheet iron outer casing and rustless cast iron or copper pan.

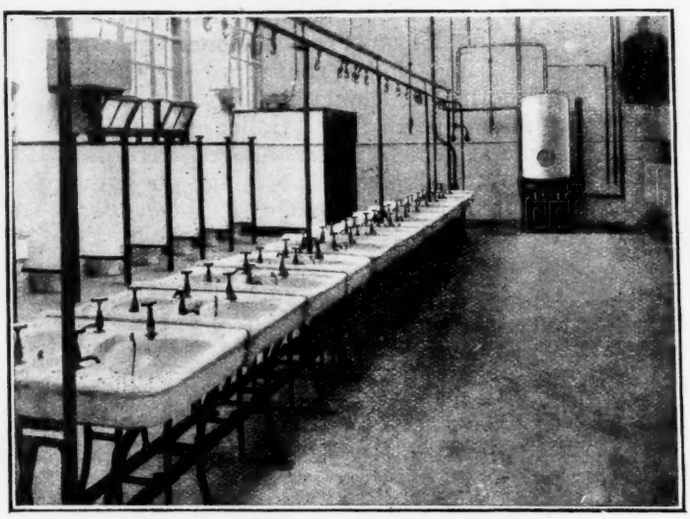
Our assistance in approaching and co-operating with Local Authorities upon the subject of complete gas equipment for new Housing Schemes is at your disposal.

THE RICHMOND

GAS STOVE & METER CO., LTD.,
Warrington and London.

'VICTOR' GAS BOILERS

Reliability is proved by working results.



"Victor" Boilers are installed in numerous factories, canteens, etc., an example of which is here depicted supplying hot water for the lavatory block in one of the most important foundries near London—the fourth installation adopted by the same company since 1914.

Complete Schemes prepared for any Hot Water Requirement.

Write for Catalogue:—

THOMAS POTTERTON, HEATING ENGINEER AND PATENTEE,

CAVENDISH WORKS, BALHAM, LONDON, S.W. 12.

Telegrams: "POTTERTON BAL. LONDON." Telephones: STREATHAM 2052, 2053.

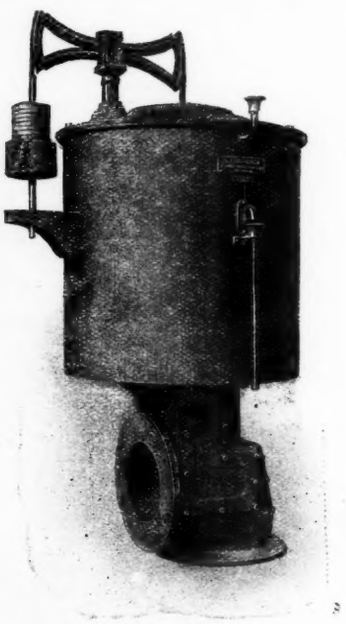
BRADDOCK'S RETORT-HOUSE GOVERNORS

HAVE PROVED TO BE

SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



No. 310.
Braddock's New Patent Enclosed Retort-House Governor. Latest Type.

Further Particulars upon Application.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), **Globe Meter Works, OLDHAM.**

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.

Telegrams: "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

while a gas cooking-stove is fitted in the scullery. In the other types a gas-cooker *only* is provided, and an open grate is fitted in the living-room instead of the range.

Water Heating.—There is a great advance in labour-saving in this scheme, inasmuch as the hot water to the sink and bath taps is obtained from a combination gas-heated boiler and 20-gallon storage cylinder; the latter being provided with a cut-out valve, by means of which the quantity of water being heated at any time can be reduced to 5 gallons. This arrangement is made to provide the water for scullery work, washing floors, &c., without heating the whole contents of the storage cylinder, which is only required for bath purposes, when a turn of the valve has the desired effect. A thermostatic valve is also attached, to automatically reduce the gas consumption when the water in the storage cylinder reaches the desired temperature.

The apparatus is fitted in a recess in the scullery, mounted on cantilever brackets. A solid fuel washing copper is fitted beneath it, so that both sets of apparatus only take up the same floor space.

Heating.—A gas-point is run to the side of the hearth in the parlour, ready for the installation of a gas-fire, if required.

SOME SUGGESTIONS BY THE "BUILDER."

While the schemes set out above—more especially at Roe Green—are probably more comprehensive as regards the use of gas than has usually been the case in similar class houses in the past, the "Builder" believes that they will not prove the last word in this direction, but that, in order (as far as is economically possible) to reduce women's labour in the house, while also aiming at hygienic improvements, there may in the near future be further extensions of the use of gas for water-heating and heating.

Lighting.—The installation of inverted incandescent gas-burners throughout will ensure the houses being well and cheaply lighted; but where such systems are installed, some arrangement should be made by the housing authorities to provide a system of mantle and burner maintenance. The local gas undertaking would probably quote a low figure for this valuable service.

Cooking.—The type of cooking-stove fixed at Roe Green seems a good one for the purpose, being fitted on a small stand, with legs about 6 in. high, to raise the oven sufficiently to prevent the need of stooping when using it, and to allow the floor beneath the stove to be readily cleaned.

Heating.—The gas-point at the hearth in the parlour at Roe Green should be useful, as a small gas-fire here for intermittent heating should be quite economical to use. In future schemes, indeed, it would seem advisable to have similar points run to the bedroom fireplaces, as the tenants are seldom likely to light solid fuel fires in such rooms, though they might subsequently be glad of the opportunity (without disturbance to the building or furniture) to have a gas-fire installed in one or other of the bedrooms, which could be used now and again for short periods in the cold weather, at a very low fuel cost.

Water Heating.—As regards the water heating, it would seem necessary to instal some kind of fire-grate in the living-room (probably not a kitchener), with a saddle-boiler behind it, and an oven above; so that in the cold weather a solid fuel fire (a mixture of coal and coke would be most economical) would provide warmth, while at the same time cooking food and heating water. The pipes from the saddle-boiler could be connected to the storage cylinder of the gas-boiler in the scullery, so that the gas would only need to be used to provide hot water in the warmer weather. Gas for continuous—all-the-year-round—use, to provide hot water, might prove too costly; while the continuous use of solid fuel would probably be objected to for other reasons, especially in the summer. Therefore, a suitable combination of both would seem to be ideal.

Washing Copper.—A gas-heated washing copper will probably be fitted in some cases, as for intermittent use the fuel cost would be low.

THE THREATENING ATTITUDE OF BRITISH MINERS.

Yorkshire Experts on the Causes of Unrest.

A Special Correspondent, writing from the centre of the Yorkshire coalfield, says: Most experienced experts in every branch of the Northern coal industry convince me that, after the spell of unwonted discipline he has undergone, the miner thinks it is high time he had a holiday. Men who move about a great deal among miners in the Durham, Northumberland, Yorkshire, and Midland coalfields know well most of the chief reasons why the coal getter has arrived at this conclusion. Some of these causes are well known; others are not so apparent. Intimate friends of the late Mr. Ben Pickard, Mr. Crawford, Mr. Firth, and other Yorkshire miners' leaders can well recollect how uneasy these office-bearers became when the accumulated funds of the Yorkshire Miners' Association reached hundreds of thousands. The larger the amount of savings, the more rigidly was the secret kept; for whenever the total sums in hand available for strike pay passed a certain point, a numerous section of the members grew restless, and confessed that they wanted "a bit of a laake." The blame was generally put on the young unmarried men with light responsibilities, though not a few of their comrades with wives and families, yet who had saved up for a little "let-off," were as ready as the rest to enjoy a course of knur and spell, pigeon flying and shooting, rabbit coursing, or some other sport.

Now, at this moment, the 800,000 colliers of Great Britain who are connected with Unions are believed to have laid by for emergencies a sum approaching £2,000,000. Not a word has transpired about this; but the writer has it from a high official who is entitled to know. This authority is now troubled with the same foreboding which used to afflict Mr. Pickard and his colleagues. It is estimated that £2,000,000 would be quite enough to maintain for a month the entire working staff engaged in the British coal trade; and the collier is of opinion that this period would be quite long enough to bring the Government and the nation to submission. On the highest possible authority, I

Wright's "Compact Eureka" Gas-Cooker, with extra large Hotplate and "Lewis" Patent Plate-Rack and Backplate. The latter folds down flat when not in use.

'Eureka' Specialties FOR NATIONAL HOUSING

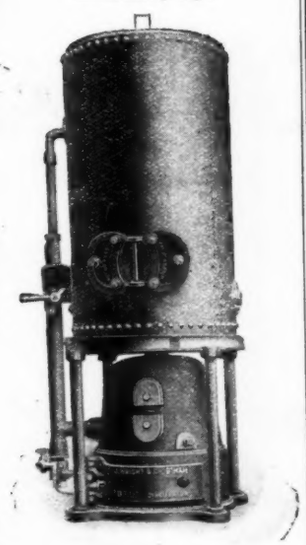
NOW is the time to bring to the notice of Housing Authorities, Architects, Property Owners, Estate Managers, Builders, &c., the advantage and economy of Gas-Heated Apparatus for meeting the entire domestic needs of

COOKING, WARMING, and HOT-WATER

Supply. We shall be pleased to co-operate and assist you with information and practical suggestions if you will communicate with us.

JOHN WRIGHT & CO.,
Essex Works, Aston,
BIRMINGHAM.

Hot-Delivery Pipe.



Wright's "B.T.U." Combined Hot-Water Circulator and Storage-Tank, with Patent "Thermostat" and new "Economy" Valve. Supplied on High or Low Stand.

am enabled to state that there are no stocks of fuel worth mentioning anywhere; that householders, industrial establishments, gas and electricity producers, and all other users of coal are all being served with supplies on a "day-to-day" system; and that a fortnight's general stoppage of pits would bring everything to a standstill. Miners and their leaders know this as well as the central and divisional coal controllers. Hence the Miners' conference could not possibly have selected a more opportune time for the promulgation of their "Charter."

"With plenty of coal and other material, and an adequate supply of skilled labour, prospective business in the manufacturing industries of England is so plentiful that we might have a run of ten years of uninterrupted prosperity," remarks an expert who understands the situation thoroughly. Says the same authority: "One of the causes of the present unrest is that a demobilized miner, on returning from the Front, and not being able for some reason or other to start at his old job, envies the ex-munition maker, who gets a good unemployment allowance. The 125,000 miners who have been demobilized cannot all begin work straight away. Some are disabled; and when others relieve civilians of their occupation, the miner thinks the latter should not lose anything by the change-over. Then, too, you will see that the first item in the 'Charter' is that all demobilized miners shall be fully discharged from the Army and Navy and reinstated in their old positions as soon as they desire and are able. Of course, till they are discharged, they are soldiers under military control, which a demobilized miner considers irksome, for 'D.O.R.A.' is still in force.

The proposal of a further rise of 30 p.ct. on the present wages and a six-hours' day are as serious as the other proposals. Added to all the advances and bonuses given during the war, 30 p.ct. would bring the total additions to pre-war pay to from 150 to 180 p.ct. An increase of 30 p.ct. would represent about 4s. a day for each of 1,000,000 men employed in and about the pits, or a total of £200,000 a day. Five days make an ordinary working week at British collieries; so that a 30 p.ct. advance would amount to £1,000,000 a week. The whole of this increase would necessarily fall upon the cost of production and the price of coal. The 'snap-time' grievance, which chiefly affects surface men, is more serious than it looks. For many years top men have been allowed in relays to eat a meal from 10 to 10.20 every morning, and the pit was kept going. The reason for wishing work to stop entirely for twenty minutes seems to be a desire to shorten the working day. Ten of the largest collieries in Yorkshire are idle from this cause, which means a loss of 20,000 men and 200,000 tons of coal a week. And the mischief seems to be spreading from South to West Yorkshire. Nationalization of mines seems to have been included in the demands of the Men's Federation by way of rounding-off and completing the list, though immediate legislation is sought for this step and a six hours' day."

The Right Hon. T. M'Kinnon Wood has been elected Chairman of Messrs. Glover and Main, Ltd., and also of the associated companies of Messrs. Thomas Glover & Co., Ltd., and Messrs. R. & A. Mains, Ltd.

GAS WORKERS AND THE WHITLEY REPORT.

It is significant of altered labour methods of propaganda that the Whitley report is now being taken up by gas-workers, among others, in the Midland Counties in a spirit commensurate with the importance of the recommendations which it contains. Mr. Arthur Hayday, the newly-elected Parliamentary representative for West Nottingham, and District Secretary of the Gas Workers' Union (now known as the Federation of General Workers), when speaking at a representative conference, on Monday of last week, at the Exchange Hall, Nottingham, was emphatic in his support of the Whitley recommendations—not, as he put it, that he regarded them as affording a solution of industrial problems or of settling the wages question, but rather as presenting a possibility of bringing into being means and methods which have been previously unsuccessfully fought for. He had, he declared, conducted more strikes than he cared to remember in support of the primary rights of the workers to be represented by their trade union officials at conferences with employers. He argued, however, that if men owed something to the State through industry, industry owed something more to the men than was at present paid. Admittedly, discontent could not be entirely eradicated; but he suggested that difficulties might be so dealt with that they need not cause strikes save as a last resort. The utterance upon the part of Mr. Will Thorne's former coadjutor at West Ham is not uninstructive as an evidence of the changing temper of the times.

COURT OF ARBITRATION AWARD.

PIPE-FITTERS—GAS LIGHT AND COKE COMPANY.

The Court of Arbitration have issued their award in the case of the rate of wages for pipe-fitters employed by the Gas Light and Coke Company.

The parties to the reference were the Gas Light and Coke Company, Beckton, and the National Union of Operative Heating and Domestic Engineers. The claim submitted was that pipe-fitters in the Company's works at Beckton should be paid the recognized London rate of wages. The matter was referred by the Ministry of Labour to the Court of Arbitration for settlement; and representatives of the parties were heard on Dec. 11 last. The men concerned employed as pipe-fitters received, at the date of the hearing, rates varying from 8¼d. to 10¼d. an hour, *plus* the war wage advances. They claimed the recognized London rate for skilled fitters, which they stated was 10¼d. an hour. At the hearing, the parties concerned agreed to confer with a view to arriving at a settlement on the matter. A conference was held, but no agreement was reached; and the Court were asked to issue an award. The Company expressed their intention of increasing the rates of several of the men

Back to Peace Work

¶ The Davis Gas Stove Co., Ltd., are now about to complete the bulk of their munition contracts, and will therefore be shortly resuming Peace Work up to the hilt of their resources.

¶ The indulgence of Gas Managers is invited during the difficult period of "changing over," pending the complete restoration of normal manufacturing conditions.

Various types of Cookers and Fires delivered from stock. Orders for other goods accepted for early precedence.

THE DAVIS GAS STOVE CO., LTD.,
60, OXFORD ST., LONDON, W. 1.

concerned. It has not been the district practice in the past for fitters' rate to be paid to fully-skilled pipe-fitters. The Court did not think that adequate grounds existed for altering a pre-war practice in this respect; and their decision is that the Union's claim has not been established.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 20.

In the London market, pitch retains its price of at least 65s. net per ton f.o.b. makers' works, notwithstanding the large business for Belgium in Yorkshire pitch, which is reported at a materially lower figure. The fact is that London makers are very well sold for this half year. In creosote, the position is quite strong; and as the official control has been formally removed, a price of about 6½d. per gallon can be obtained. Apart from the home demand, the United States are serious buyers. Solvent naphtha is rather neglected, and the value is 3s. to 3s. 3d. net per gallon; while for motor benzol, absorbing benzol and toluol, there is a good demand at about 2s. 4d. for commercial purposes. The present outlook for carbolic acid is not exactly cheerful; and any quotation for 60's crude could be a nominal one only. Possibly this situation may cause some makers to consider whether it might be advantageous to temporarily stop the manufacture of this article.

In sulphate of ammonia there is nothing new to report.

Tar Products in the Provinces.

Jan. 20.

The average values for gas-works products during the week were: Gas-works coal tar, 30s. 6d. to 35s. 6d. Pitch, East Coast, 44s. to 45s. per ton; West Coast—Manchester 37s. 6d. to 40s., Liverpool 37s. 6d. to 40s., Clyde 37s. 6d. to 40s. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 7d. to 1s. 8d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. 10d. to 2s. 11d. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 4¼d. to 4½d. Heavy oils, in bulk, North, 5d. Naphthalene, £25 to £30; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per minimum 40 p.ct.; "B" quality, 1½d. to 2d.

Manchester District Tar Prices.

The average price realized for tar in the Manchester district, based on the value of the products, for the month of November was £2 4s. 10d. per ton.

FROM A MARKET CORRESPONDENT.

Tar Products.

Business in tar products generally shows some signs of broadening. There is very little change in pitch, although the shipping position remains very strong and there is the prospect of some large quantities being required for road-making purposes. The position regarding South Wales purchases is still interesting, and the briquette makers are continuing to exert their influence to depress reasonable prices. Makers, however, feel very sure of the future, and anticipate a higher range of prices very soon. In some Provincial centres, they say 53s. to 55s. should be the price; for the production costs show no signs of declining. Toluol is nominal, although the dye industries are buying sparingly. In benzols, however, a very fair volume of trade is passing at prices last arranged; and the only trouble at the moment seems to be to find the drums and tins for distribution. As regards the price, benzol for the use of motor bus companies and other large commercial consumers is to be provided at 2s. 4d. and 2s. 3d. per gallon in tins and drums; while the price to garages is to be 3d. per gallon more. The Automobile Association is organizing all users of motor fuels, to the end that all benzol-producing firms and all gas corporations who established gas washing benzol producing plants to meet war requirements shall be encouraged and assisted to continue their work, and, further, to combat, and obtain State assistance in preventing, the danger of home produced motor fuels, including benzol, being manipulated or controlled by any trust. There is no change in creosote or crude carbolic acid; but crystals are lower on the falling off in the explosives demand for shipment. Of course, crystal has been much too dear—even the original low price of 1s. 3d. being quite generous; and if the market does not fall below this figure, makers will have no cause of complaint. Cresylic acid is fairly steady in London, but rather lower in Provincial centres. A weakness is also noticeable in both solvent and heavy naphtha; and prices are about 3d. per gallon lower since last report. Naphthalenes are steady at late rates. Aniline oil is unchanged; but anthracene has experienced a slightly decreased demand.

The range of quotations is as follows:

Benzol: 90% London, 2s. per gallon; 50-90%, 2s. per gallon.

Carbolic Acid: 60% East and West Coast 3s. per gallon; crystals 40% 1s. 4d. per lb.

Crude Tar: London 39s. to 41s.; Midlands 33s. to 35s.; North 32s. to 34s. per ton *ex* works.

Pitch: London 65s. per ton f.o.b. works; East Coast, 38s. to 42s.; West Coast, 41s. 6d. to 43s. f.a.s.; Manchester, 41s. to 42s.; Clyde, 41s.; South Wales, 45s. to 46s. per ton.

Solvent Naphtha: London 3s. 9d. to 4s.; North and Midlands 3s. 3d. to 3s. 6d. per gallon.

Crude Naphtha: Naked 1s. 1d. per gallon.

Heavy Naphtha: London 3s. to 3s. 6d.; Provincial 3s. 3d.

Naphthalene: Refined £28 per ton nominal; salts 80s., bags included.

By Appointment.

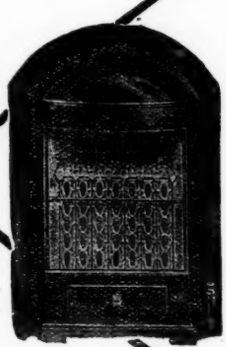
Still further improvements in Gas-Fire construction.

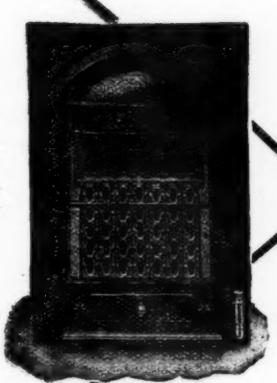
CARRON

"STELLA"
THE SILENT GAS FIRE.

Those who have seen and tested it are loudest in its praise.

Besides radiating an intense silent heat, it possesses other desirable and exclusive improvements, for particulars of which you are referred to the Company's No. 6 pamphlet, free on application.





CARRON COMPANY Works: CARRON, STIRLINGSHIRE.

Branch Works: Phœnix Foundry, Sheffield.

Showrooms: LONDON—(City) 15, Upper Thames St., E.C.4; (West End): 50, Berners St., W.1. LIVERPOOL—22-30, Redcross St. GLASGOW—125, Buchanan St. EDINBURGH—114, George St. BRISTOL—6, Victoria St. NEWCASTLE-ON-TYNE—13, Prudhoe St. BIRMINGHAM—218, 220, 222, Corporation St.

Toluol: Naked, 3s. 4½d. per gallon nominal.

Creosote: Nominal, London 4¼d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4⅞d. per gallon); heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

The home trade is about normal; the output being fairly well taken up. The export position is, in some quarters, regarded as rather more promising in view of the gradual cessation of the munitions demand for ammonia, which should set free a certain quantity of sulphate. It is generally anticipated that control will be removed as soon as the spring requirements have been met; but it is, of course, possible that some relaxation will be permitted at an earlier date. Meantime, the trade is somewhat concerned with acid prices, which, it is claimed, should be substantially reduced. Synthetic processes are of very little interest to the trade now, as the success attending the official scheme is so far nothing very important. From official silence on the matter, the inference is that not even the purely experimental stages have been successfully passed. A further report is long overdue. The trade is surely entitled to it, especially as relating to the economic and financial aspects of the matter.

Swansea Corporation and the Gas Company.

The Town Clerk reported at a meeting of the Swansea Corporation Parliamentary Committee that, with regard to the application of the Gas Company to the Board of Trade for their consent to increasing the price of gas, he had made representation to the Board of Trade against the Company's application; that he had subsequently instructed Mr. W. B. Keen to deal with the technical financial matters arising; and that interviews had taken place with the Gas Company when Mr. Keen and Mr. Ashmole had shown errors in the Company's figures. He further reported that he received a letter from the Solicitors of the Gas Company to the effect that the Board had made an application for the Company's Accountant to discuss the question with them in an informal manner. The Town Clerk stated that he had no intimation from the Board of Trade, but he immediately got into communication with Mr. Keen, and asked him to be present at the interview with the Board. He accordingly attended. He added that he had pressed for a proper inquiry by the Board of Trade; but they had taken the course indicated, notwithstanding his representations.

A destructive riverside fire at Wapping last week, appeared at one time likely to involve the works of the Commercial Gas Company; but fortunately the brigade were successful in their efforts to prevent the flames spreading.

Matlock Gas Company's Powers.

The powers of the Matlock (Derbyshire) Gas Company were discussed at an interview between the Matlock District Council and Mr. J. H. Hall, Electrical Engineer, of Glasgow, who contemplates preparing a scheme for supplying the town with electricity. The Chairman (Mr. L. G. Wildgoose), explaining the position of the Council in the matter, said during the period of office of a late Council the Matlock Gas Company obtained, by Act of Parliament, certain powers relating to the supply of electricity in the town; but he did not know exactly what these powers were. Mr. Richards said when the electrical railless trams were suggested, it was found that nothing could be done because of the monopoly of the Gas Company. If electricity was required in Matlock, and if a sufficient number of ratepayers guaranteed to take a certain quantity of electricity at a cost which would make the scheme a remunerative one, no one could supply it until the Gas Company had first refused to do so. Mr. Wildgoose expressed regret that any such powers had been incorporated in the Gas Company's Act. All the Council wanted was to supply the public with the best lighting possible at the cheapest rate. He thought, however, it was not worth while going into the matter further until they were sure of their ground. Mr. Hall said he was not aware that the Gas Company had any powers over electricity; and he asked when the monopoly was given. Mr. Drabble said he believed the powers were given when the Company was formed. Mr. Hall promised that he would investigate the position. Mr. Wildgoose remarked that if he found that the difficulties were not insurmountable, and he would approach the Council again, they would be pleased to hear him.

Increased Gas Prices at Coalville.—An increase of 5d. per 1000 c.ft. in the price of gas is notified by the Coalville Urban District Council. This will make the charges 5s. per 1000 c.ft. for prepayment meters, 4s. 7d. for ordinary consumers, and 3s. 9d. for motive power.

War Bonuses and Municipal Finances.—The effect of war wage increases on the finances of municipal undertakings was the subject of a resolution carried by 19 votes to 11 at a meeting of the Salford Borough Council last Wednesday. The resolution, moved by Alderman Phillips on behalf of the Special Committee on War Bonuses, urged that a communication be forwarded to the Committee on Production, pointing out the serious financial position in which the Council are placed in consequence of the Committee's action in making awards granting war-time increases to manual workers without previously consulting municipal authorities, and asking the Committee what action they are prepared to take to relieve the financial strain thus imposed. Alderman Phillips said the Salford Corporation were paying in war bonuses and allowances £298,578 per annum. The Gas Committee were called upon to find nearly £57,000 per annum, and the Electricity Committee about £19,000. He did not hope to get financial help from the Committee on Production; but the resolution might help to put some check on the granting of awards.

"CANNON" Gas Cookers

The "COUNTY"

Still maintains its POPULARITY, OWING TO ITS MANY ADVANTAGES.

UP-TO-DATE IN CONSTRUCTION.

An Ideal Cooker for Hiring-Out Purposes.

CANNON IRON FOUNDRIES, LTD.,

DEEPFIELDS, Nr. Bilston, Staffs.

London Office and Show-Rooms:—

BATH HOUSE, 57-60, HOLBORN VIADUCT, E.C.

Australasian Agents: MOLDEN & BUDDEN PTY., Ltd., 364A, Little Collins Street, Melbourne, Vic.; and at SYDNEY, N.S.W.

Electricity Breakdown at Manchester.—A stoppage of tramway cars on all routes except those in the centre of the city occurred last Tuesday evening in Manchester, through a temporary breakdown at Stewart Street Electric Station. Shops and houses in some districts were in darkness for a time, owing to the failure of the current.

Salford and Committee on Production Awards.—It has been decided by the Salford Corporation to send a protest to the Committee on Production, pointing out the serious financial position of the Corporation arising out of the action of the Committee in making awards granting war-time increases to workers without consulting municipal authorities. Alderman Phillips said the awards of the Committee were spasmodic, and there was no finality about the business. The position of Salford was becoming a very serious one. The Corporation, in war bonuses and allowances to dependants and servants, were now paying £298,578 per annum. To meet this additional expenditure, they had had to increase the rates, tram fares, and the prices of gas and electricity. The payments made by the trading departments were: Tramways, bonuses £89,768, allowances £28,160; gas, bonuses £49,629, allowances £6760; electricity, bonuses, £15,988, allowances £2362.

Stafford Gas Undertaking.—The Stafford Town Council have decided, on the recommendation of the Gas Committee, that Messrs. C. & W. Walker, Ltd., be allowed, in addition to the contract price of £11,841, the sum of £2600 to cover the extra cost of carrying out their contract for the new one million feet gasholder and tank. The extra cost, which was due to circumstances beyond the control of the firm, amounted to £4179; but, as the result of negotiations, they were willing to fix the amount at the figure stated.

State Aid to the Dye Industry.—In accordance with the scheme for affording State assistance to the dye industry, the Board of Trade have appointed a Trade and Licensing Committee (with Lord Colwyn as Chairman), who will determine the colours and intermediates which shall be licensed for import into the United Kingdom after the conclusion of peace, and in what quantities, and to advise the Commissioner for Dyes as to the colours and intermediates the manufacture of which should be specially encouraged, and the order of their importance. For the purpose of the licensing of imports, the Committee will appoint a Licensing Sub-Committee. The Secretary of the Committee and of the Licensing Sub-Committee will be Mr. W. Graham (Board of Trade), No. 7, Whitehall Gardens, S.W.

STOCK MARKET REPORT.

IT has come at last! The Stock Exchange really woke up last week, and emerged from the torpid and anæmic condition into which it had gradually sunk—something resembling the lethargy of a hibernating animal. It was the more gratifying seeing that War Bonds were making a brilliant finish to their triumphal progress. Moreover, the recovery extended to many classes of securities, and was not limited to special favourites.

In the gilt-edged division, Home Government issues of all sorts were in excellent case. All War Loans were in steady demand daily, especially the 5 p.ct., which touched a fraction above 95 before the close. Exchequer Bonds and Consols did well; the latter reaching 59⅝. Home Rails were a prey to strike fears, moving irregularly and finishing dull. Canadians, too, were easy; and Argentines, after a smart recovery, had a fit of reaction. French Loans were again the cynosure of attention, improving their position daily. Russians were regarded more hopefully, and received some support.

Business in the Gas Market shared in the general wake-up; the volume of transactions marked showing a good increase, and being better distributed throughout the list. The general tendency was entirely favourable with the exception of one or two undertakings which are dominated by circumstances special to themselves. In result, the quotations of Aldershot, Gas Light ordinary and debenture, South Metropolitan preference and debenture, Tottenham debenture, and San Paulo showed advances. On the other hand, Primitiva ordinary, preference, and 1911 debenture fell. Imperial Continental receded 1; but the debenture rose to a like extent.

Bargains done for cash during the week were as follows: On Monday, Bournemouth debenture 67, 67½, Gas Light ordinary 73¼, 73⅜, ditto maximum 57, 57½, Hastings and St. Leonards 5 p.ct. 62, ditto 3½ p.ct. 46½, Imperial Continental 118, 118½, 119¼, Primitiva 36s. 9d., 37s., ditto preference 62s. 9d., 63s., 65s., 70s., South Metropolitan 76½, South Suburban 79½. On Tuesday, Alliance and Dublin 53⅜, Bombay 6½, Brentford "B" 73⅜, 73½, Continental Union 50, ditto preference 73, Gas Light ordinary 73½, 73⅜, 73⅝, 74, 74¼, ditto preference 70½, Imperial Continental 117, 118¼, 118½, Primitiva preference 62s. 6d., ditto debenture (1911) 47½, 48, South Metropolitan 76, 76½. On Wednesday, Brentford "A" 79¾, Gas Light ordinary 73½, 74, 74¼, Primitiva 35s., ditto preference 62s. 6d., South Metropolitan 76, South Suburban debenture 90, Tottenham debenture 63¼. On Thursday, Alliance and Dublin 53¼, 53½, Bombay 6 1/16, British 31⅛, Gas Light ordinary 73¼, 74, 74½, ditto maximum 57, ditto debenture 56, 56⅜, Liverpool 79, Imperial Continental 118, 118⅜, 118½, 119, Oriental 106, Primitiva 35s., 37s. 6d., ditto preference 66s. 3d., 67s. 3d., 67s. 6d., South Metropolitan 76, 76½, South Suburban debenture 89⅜, 90. On Friday, Bournemouth 10 p.ct. 23½, Brentford "A" 80, 80½, Continental Union 50, 50¼, Gas Light ordinary 73½, 73⅜, 74, 74½, ditto maximum 56½, ditto debenture 56½, 57½, Imperial Continental 117½, 118, 118½, 119, Primitiva 37s. 6d., ditto debenture 75⅜, 75½, South Metropolitan 75½, 76¼, 76½.

In the Money Market, after an easy opening there arose a strong demand, largely ascribable to War Bond applications. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
122,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	61—63	..
1,551,868	"	April 8	2½	4⅜	Alliance & Dublin Ord.	50—54	51—56	53⅜—53½
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63*	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	6⅜—6⅝	6 1/16—6⅛
50,000	10	Feb. 26	16	11%	Bournemouth Gas 10 p.c.	29—30	23—24	23½
883,110	10	"	7	7%	Bournemouth Gas B 7 p.c.	15—15½	10½—11½	..
115,000	10	"	6	6/-	Bournemouth Gas and Water Pref. 6 p.c.	13½—14	9½—9⅝	..
159,740	—	—	—	4%	Bournemouth Gas and Water 4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	4⅛%	Brentford A Consolid.	261—266	78—81	67—67½
784,990	"	"	11	4⅛%	Do. B New	204—209	72—77	79½—80½
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	77—82	78⅜—78½
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—98	62—64	..
217,880	"	Feb. 26	11	8⅛%	Brighton & Hove Orig.	208—218	140—145	..
244,200	"	"	8	5⅛%	Do. A Ord. Stk.	154—159	97—102	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
580,000	20	Mar. 26	12½	22/6	British	44—45	31⅛—32½	31⅜
190,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3⅜—4½	..
100,000	10	—	—	4⅛%	Do. 4½ p.c. Pref.	4—6	7½—8½	..
100,000	Stk.	June 26	4½	4⅝%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,518,280	"	Feb. 12	5/9/4	36/-	Commercial 4 p.c. Stk.	106—108	62—67	..
560,000	"	"	5⅛	30/-	Do. 3½ p.c. do.	103—105	58—63	..
475,000	"	June 11	8	8%	Do. 8 p.c. Deb. Stk.	69½—71½	51—53	..
800,000	"	"	4	—	Continental Union Ltd.	76—79	50—55	50—50½
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	70—75	73
51,600	Stk.	Aug. 29	14½	13⅛%	Croydon A 10 p.c.	..	160—170	..
278,400	—	"	11½	10⅓%	Croydon B and C 7 p.c.	..	125—140	..
492,370	Stk.	—	6	5½%	Derby Con. Stk.	128—125	95—100	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	13—14	..
15,298,975	Stk.	Feb. 10	4/17/4	29/4	Gas 4 p.c. Ord.	98—102	73—75	73½—74½
2,600,000	"	"	8½	8⅓%	Light 8½ p.c. max.	76—79	56—58	56½—57½
4,062,235	"	"	4	4%	and 4 p.c. Con. Pref.	96—99	69—71	70½
4,674,850	"	June 11	8	8%	Coke 3 p.c. Con. Deb.	72½—74½	56—58	56—57½
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
82,500	"	Mar. 12	6	4½%	Hastings & St. L. 5 p.c.	..	60—65	62
258,740	"	—	3½	2⅓%	Do. 3½ p.c.	87—89	45—50	46½
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	7⅛—8½	..
86,600	Stk.	Sept. 12	9	9⅛%	Hornsey 7 p.c.	..	117—122	..
181,000	"	Mar. 12	7½	6⅔%	Ilford A and C.	151—154	92—97	..
65,780	"	"	6½	4⅝%	Do. B	115—118	70—75	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65*	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150—160	117—122	117—119½
1,325,000	"	Feb. 12	8½	8⅓%	Do. 8½ p.c. Deb. Red.	84—86	72—74	..
235,242	"	Mar. 12	6½	6⅓%	Lea Bridge Ord. 5 p.c.	119—121	93—98	..
2,498,905	"	Feb. 26	10	5%	Liverpool 5 p.c. Ord. A	211—218	82—84	79
					Liverpool 5 p.c. Ord. B	146—148		
806,088	"	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk.	..	71—73	..
165,736	"	Aug. 15	4½	4½%	Maidstone 5 p.c.	..	60—65	..
75,000	5	June 11	6	8%	Malta & Mediterranean	4½—4⅝	3½—3⅞	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	90—97	..
541,290	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	91—97	..
1,875,899	Stk.	July 29	4½	8⅛%	Newcastle&Gateh'd Con.	98½—99½	73¼—74½	..
539,705	"	June 26	8½	8⅓%	Do. 3½ p.c. Deb.	82—88	57—59	..
55,940	10	Feb. 26	7/14/0	7⅛%	North Middlesex 7 p.c.	14—16	9½—10½	..
800,000	Stk.	May 14	6	6%	Oriental, Ltd.	117—122	103—105	106
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	4—5	..
60,000	50	Feb. 26	12	9⅓%	Portsea, Island B	128—131	78—88	..
100,000	50	"	12	8%	Do. C	118—121	80—85	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅜—2½	35/—37.6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	3—3½	62/6—70/-
521,800	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	74—76	75⅜—75½
600,000	Stk.	July 31	4	4%	Do. " " 1911	..	47—50	47½—48
846,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	7⅜—8½	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	40—43	..
185,000	Stk.	Mar. 12	10	10%	Sheffield A	228—234	170—173	..
209,984	"	"	10	10%	Do. B	222—234	170—173	..
522,500	"	"	10	10%	Do. C	220—222	168—172	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African.	10½—11½	13—14	..
6,609,895	Stk.	Feb. 10	5/4/0	32/-	South Met. 4 p.c. Ord.	111—113	75—77	75½—76½
250,000	"	July 12	—	5%	Do. Pref.	..	92—94*	..
1,895,445	"	July 10	8	8%	Do. 3 p.c. Deb.	73¼—74½	54—56*	..
224,890	"	Feb. 26	8½	8%	South Shields Con. Stk.	167—169	114—116	..
962,795	"	"	6	3⅛%	S'th Suburb'n Ord. 5 p.c.	114—116	77—80	79½
60,000	"	"	5	5%	Do. 5 p.c. Pref.	110—112	75—78	..
135,000	"	Feb. 26	5	3⅓%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	87—90	89½—90
647,740	"	May 14	5	3%	Southampton Ord.	99—102	67—70	..
190,000	"	Feb. 12	7½	5⅓%	Tottenham A 5 p.c.	125—128	92—97	..
782,275	"	"	6	4%	Tottenham District B 5½ p.c.	115—117	67—69	..
181,255	"	June 26	4	4%	Tottenham District 4 p.c. Deb.	87—89	62—64	63½
189,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
286,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109	87—88	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	"	Feb. 26	8⅜	63/9	Wandsworth A 5 p.c.	151—156	90—95	..
255,686	"	"	6⅜	48/9	Do. B 3½ p.c.	129—134	70—75	..
852,000	"	"	6⅜	42/6	Wimbledon 5 p.c.	117—122	70—75	..
98,000	"	"	6⅜	48/9	Epsom 5 p.c.	121—126	72—77	..
88,416	"	June 26	3	3%	3 p.c. Deb. Stk.	66—69	40—52	..

* *Ex div.*

Gas Explosion at Blackburn.—Early on Friday morning last, considerable damage was caused by a gas explosion at the Corporation Arms Hotel, Bank Top, Blackburn. The proprietor, Mr. Percy Ellis, and his wife, had a narrow escape from serious injury. A defective gas-pipe is supposed to have been the cause of the accident.

Stornoway Gas-Works Purchased.—The Stornoway Gas Company has been bought by Lord Leverhulme, at a price which is regarded by the shareholders as satisfactory. He is proprietor of the Island of Lewis, and intends to establish an electric power station at Stornoway. The Stornoway Gas Company had power by Provisional Order to put down an electric installation.

Armagh Gas Supply.—A meeting under the auspices of the Armagh Workers' Union passed a resolution of protest against "the treatment meted out to the workers by the irregular action of the Gas Company;" it being stated that textile workers had had to cease work because of the defective gas supply in some factories. It was asked that the City Council should take the matter in hand at once.

Rates of Interest on Local Loans.—In terms of the powers conferred by the Public Works Loan Act, 1918, the Treasury give notice that the rates of interest on local loans not secured on rates may be 6 p.ct. for periods not exceeding thirty years, and 6¼ p.ct. for periods not exceeding fifty years; but these rates shall not apply to loans under the Housing Acts, the Harbour and Passing Toll Act, 1861, and loans to Territorial Associations.

Motor Spirit from Coal.—The "Petroleum Times" understands that the Ministry of Munitions will for the present continue to work the plants at certain collieries and at gas-works in order to distil motor spirit from cannel coals and other waste minerals which abound in the various colliery districts of the Midlands. With the arrival of a conclusive peace, our contemporary learns that the plants at the collieries will be sold to the owners of the latter.

Poor Gas at Whitburn.—Reports are to the effect that the action of the Sunderland Gas Company, who are applying to Parliament for sanction to take over the Whitburn Gas Company, is receiving the support of many of the villagers. They state that the quality of the gas that is at present being supplied to them is such that where a light is necessary the windows must be opened. In order that the villagers may not become prejudiced against the use of gas, the Sunderland Gas Company are doing all in their power to bring about a change as soon as possible.

Coleraine Gas Supply.—It was reported to the Coleraine Urban Council that a failure of the gas supply, which occurred on Christmas Eve, and which caused much inconvenience to business people and private consumers, was caused by the demand exceeding the supply. The Manager of the works said he had less than a fortnight's coal stock on hand, and that he had been pressing the Irish Coal Controller and the contractors to expedite matters, so as to obviate the risk of a breakdown which might be very serious in its effects upon industry and general business.

South Suburban Company's Co-Partnership.—The Co-Partnership Almanack for 1919 of the South Suburban Gas Company contains a Directors' message to all the co-partners (signed by the Chairman, Mr. Charles Hunt), in which it is mentioned that under the powers granted to the Company by the Dartford Amalgamation Act, the Board are prepared to consider any recommendation of the Co-Partnership Committee to supplement any Government allowance or pension to dependants of employees who have laid down their lives for God and country, which in the opinion of the Committee does not sufficiently meet the circumstances.

Price of Gas at Smethwick.—There is, it seems, a prospect of a still further increase in the price of gas at Smethwick. In November, the Council authorized the Gas Committee to increase the price from the December quarter, should it be found necessary. Now, in view of the increases in wages already granted, and other heavily increased liabilities in connection with manufacturing charges and the restoration of public street lighting, the Committee have decided that for lighting and domestic purposes and for motive power the price be increased 4d. per 1000 c.ft., and for gas supplied through prepayment meters, 3·2d. A further application has been received from the Amalgamated Society of Gas-Workers for payment of the increase of 5s. per week awarded to the engineering and foundry trades; and this, if granted, will necessitate another increase in the price of gas.

Edinburgh and Gas Rationing.—The Edinburgh Town Council have adopted a motion that representation be made to the Controller of Mines requesting that the recent Order increasing the supply of gas in England and Wales by 25 p.ct. be extended to Scotland; and that the proposed arrangement with the Ministry of Munitions to suspend all restrictions upon the fitting of gas equipment should also apply to Scotland.

Quality of Gas at Bradford.—Complaints were made at a meeting of the Bradford City Council last week about the poor quality of gas in some parts of the city. The Chairman of the Committee (Mr. J. H. Barraclough) replied that the past month had been most difficult, though an immediate improvement was anticipated. The city had holder capacity for only 24 hours' supply; and this was one of the urgent matters which would probably be brought forward as a work to be taken in hand as quickly as possible. The pressure had had to be reduced, with resultant inconvenience to the centre and lower parts of the city. The Committee had now got through the worst of their troubles.

Gas-Workers' Wages.—The periodical national revision of wages is due in February; and application is to be made by the National Federation of General Workers, of which Captain O'Grady, M.P. (Leeds), is Secretary, for advances for gas workers. The application will be for 10s. per week to all eighteen years of age and over, and 5s. to juniors, both on time rates. A conference is asked with the National Gas Council with a view to certain gas undertakings being asked to explain why the wages of their general workers have not been brought up to the level of the existing agreement of 23s. 6d., *plus* 12½ p.ct. bonus. In all cases proportionate advances will be asked for piece workers.

The Recent Strike at Nelson.—Respecting the recent strike at the Nelson Gas-Works, the Town Clerk, acting on the instructions of the Gas Committee, wrote to the National Union of Workers stating that, since the receipt of the notices to withdraw the labour of gas workers at the Brierfield works, two attempts had been made to cause such damage to the coke breaking and elevating plant as would have entailed immediate stoppage of carbonization and serious loss and expense to the department. The *modus operandi*, the letter continued, had been to insert first a brick, and later a length of wrought-iron pipe in the coke-breaking machine for the purpose of causing a breakdown, and so stopping the firing of the retorts. Mr. Smithson, the local Secretary, replying to the letter, wrote: "I have to say, on behalf of our members, that, as a union, we have no knowledge whatever that such things have taken place, and as a union we should strongly deprecate any such action by any of our members. We are informed, however, from good authority, that such things have occurred before many times through accidents; and we are of the opinion that, if this had been done on purpose, some of our members would have reported the same at once."

The Lurgan Urban Council approved of the Gas Committee's recommendation for a bonus at the rate of £50 per annum to Mr. Tallentire, the Manager of the gas undertaking, to date from October, 1917, for two years, and to be reconsidered next October.

The Manager of the Youghal (co. Cork) Gas-Works informed the Urban District Council that he and the works fitter had to "give a hand" in furthering the production of gas, owing to refusals to work because of the distribution of the Government pay in respect of unemployment.

The eight-hour day movement is said to have been making great progress in different Continental countries during the past few months. According to "Glos Narodu," the Cracow Gas-Works have instituted an eight-hour working day, though this will cost Kr.260,000 yearly; and it has also been decided to increase wages by 60 p.ct., the cost to the gas-works being Kr.290,000. The sum of Kr.250,000 is to be allotted to provisioning the workmen.

On a member of the Perth Town Council challenging a proposal by the Gas Committee to give Mr. David Vass (the Gas Engineer) an increase of £25 on his salary, Mr. D. Cunningham (who moved the adoption of the recommendation) declared that Mr. Vass was "the poorest-paid gas manager in Scotland." In reply to this, the member in question urged that Mr. Vass was sufficiently well remunerated at £375 a year. By a majority, the recommendation was agreed to.

OXIDE OF IRON
FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE
PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C. 2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Nov. 19, p. 461.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

BENZOL PLANTS FOR GAS-WORKS.
BAGLEY, MILLS, & CO., Ltd.,
92, Victoria Street, Westminster, S.W. 1, Invite inquiries from all Gas-Works making 75 million cubic feet and upwards per annum.

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.
For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

OXIDE OF IRON.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

NEWBURN, ELLIS, AND PRYOR.
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent, London." 'Phone: 248 Holborn.
And 8, St. Nicholas Buildings, Newcastle-on-Tyne.